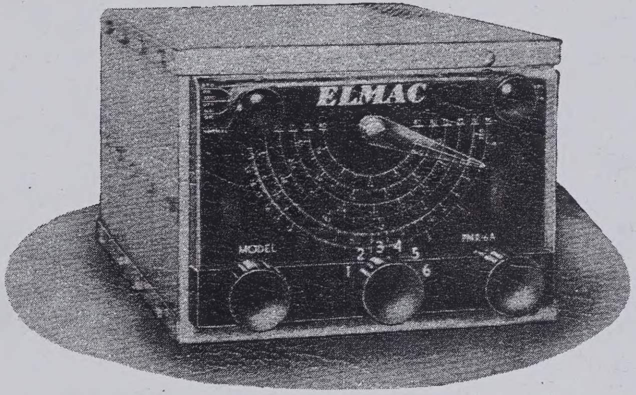
MULTI-ELMAC

Amateur Receiver

MODEL PMR 6A



INSTALLATION
AND
OPERATING INSTRUCTION
MANUAL

MULTI-PRODUCTS CO. **OAK PARK, MICH.**

Manufacturers of **"MULTI-ELMAC"** *Products*

MULTI-PRODUCTS COMPANY

Manufacturer of

MULTI-ELMAC

RADIO COMMUNICATIONS
AND CONTROL EQUIPMENT

21470 COOLIDGE HIGHWAY **OAK PARK 37, MICH.**

FORM NO. M-107

Instruction Manual

FOR

MULTI-ELMAC RECEIVER MODEL PMR-6A

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SECTION 1.

Description

1.1 GENERAL. The MULTI-ELMAC PMR-6A RADIO RECEIVER is a ten-tube double-conversion superheterodyne covering the 160, 80, 40, 20, 15 and 10 meter amateur bands, plus the standard broadcast band. Designed primarily as an efficient communications receiver for mobile use, it is also especially suitable because of its compact size for (1) marine and aircraft installations; (2) portable operation; and (3) as a fixed station or monitoring receiver. It is not intended as a converter or accessory to another unit, but a complete receiver, employing a separate power supply and speaker as described in this manual. Every effort has been made to furnish the user with an extremely stable receiver of rugged construction, compact layout, and high sensitivity.

1.2 DIMENSIONS. The maximum external dimensions of the PMR 6A receiver, including projection of control knobs, are: height, 4⅝"; width, 6¼", and depth, 10⅜". Depth behind panel is 8½ inches. Net receiver weight is 6½ pounds.

1.3 CIRCUIT DESCRIPTION. The circuit employed on all bands except the lowest frequency range consists of one stage of radio frequency amplification; a stabilized high frequency oscillator; a first mixer converting to the first intermediate frequency of 1600 kilocycles; a combination oscillator—second mixer, followed by two stages of intermediate frequency amplification at 455 kilocycles; a combination detector, automatic volume control, and noise limiter; an audio driver; a beam pentode audio output stage; a beat frequency oscillator; and a voltage regulator. On the lowest frequency range, the output of the first mixer feeds directly into the 455 kilocycle I.F. amplifier.

1.4 TUBE COMPLEMENT. The PMR-6A is supplied complete with all tubes tested in the receiver at time of alignment as follows:

R.F. amplifier	6BJ6
First mixer	6BA7*
H.F. oscillator	6C4
2nd mixer-oscillator	6BE6
1st I.F. amplifier	6BA6
2nd I.F. amplifier	6BA6
Detector, noise limiter	6AL5
1st audio amplifier	½-12AT7
Audio output	6BK5
Beat freq. oscillator	½-12AT7
Voltage regulator	OB2

*6BE6 used when 6BA7 is not available.

1.5 TUNING SYSTEM. A three-gang tuning condenser and 18 high-Q coils are used to cover the six separate bands selected by a panel switch, as follows:

Band 1—Broadcast and 160 meters	(590 to 2010 Kc)
Band 2—75 and 80 meters	(3.48 to 4.01 Mc)
Band 3—40 meters	(6.95 to 7.42 Mc)
Band 4—20 meters	(13.95 to 14.45 Mc)
Band 5—15 meters	(20.95 to 21.65 Mc)
Band 6—10 meters	(28.00 to 29.70 Mc)

1.6 NOISE LIMITER. One diode section of the 6AL5 tube is used as an automatic noise limiter. It requires no adjustment and is switched in and out of the circuit by a panel switch.

1.7 ANTENNA INPUT. The receiver is designed for use with a resonant antenna coupled to the receiver input with a transmission line of 50 or 72 ohms impedance. Detailed installation recommendations are contained in paragraph 2.3.

1.8 AUDIO OUTPUT. An output transformer matching the output tube to a permanent magnet dynamic speaker having a voice coil impedance of 3 to 6 ohms is included on the receiver chassis, with terminals brought out to the rear.

1.9 POWER SUPPLY. The PMR-6A receiver was intentionally designed to use an external power supply in order to permit (a) use of the power supply to supply the low level stages of a companion transmitter, and (b) use of the receiver with an A.C. operated power supply at a fixed station or portable location. A single relay utilized as outlined in paragraph 2.7 of this manual will eliminate the necessity for a separate power supply for the low level stages of a companion transmitter. A suitable MULTI-ELMAC power supply is available as an accessory, depending on the power source available in the vehicle or at the fixed location.

1.10 ACCESSORIES. The following accessories are available for use with the MULTI-ELMAC PMR-6A receiver:

PSR-116—Power supply for 115 volt 50-60 cycles. Supplies necessary plate and filament voltages for the receiver and can be used to power the low level stages of a companion transmitter.

PSR-116S—Same as above except that an "S" meter and adjusting potentiometer is included.
(Above supplies also available for 25 cycle operation)

PSR-6—For 6 volt D.C. operation; otherwise similar to PSR-116 above.

PSR-12—For 12 volt D.C. operation; otherwise similar to PSR-116 above.

ESS-2—2 inch relative signal strength meter, mounted in a metal box with 36" wire leads suitable for mobile installations.

SECTION 2.

Installation and Operation

2.1 **GENERAL CONSIDERATIONS.** No two installations being alike, the owner of an MULTI-ELMAC PMR-6A receiver will vary his installation according to the space available, and the individual operator's desires in regard to operating practices. Regardless of these variations, whenever the receiver is installed in a vehicle, there are three essentials to a proper installation; (1) Convenient location for operation, including ease of observation; (2) rigid mechanical mounting; and (3) elimination of radio noise. The amateur experienced in mobile radio work will have his own preferences. It is suggested that before installation is begun, the owner read the very thorough treatment given to mobile installations in past issues of QST and CQ magazines.

2.2 **MOUNTING METHODS.** The light weight of the PMR-6A makes it readily adaptable to a hanging mount from the lower edge of the dashboard. A length of aluminum angle stock from the rear corner of the receiver cabinet to the fire wall of the vehicle will complete a simple but rigid mount. Where there is sufficient knee room, and the view of essential instruments will not be obscured, a steering post mounting will be very satisfactory. A steering post mount will place the receiver closer to the normal line of a driver's vision, making for greater safety during mobile operation. If the individual wishes to spend the extra time and money and the car dashboard has sufficient space a very neat installation can be effected by making the proper cut-out into the instrument panel and mounting the receiver flush. This method is suitable where the panel contains a removable metal grille which can be replaced if the receiver is removed. Due to the great number of variations encountered in mounting methods no brackets are included. Most amateurs have enough surplus angles to fashion a bracket that would serve their particular needs better than any universal bracket that could be supplied.

2.3 **ANTENNA.** The MULTI-ELMAC PMR-6A receiver will perform most efficiently when it is coupled to an antenna resonant in the frequency band to which the receiver is tuned. As in the operation of a fixed amateur station, this condition is most easily obtained by using the same antenna for both transmitting and receiving. A change-over relay operated by the push-to-talk switch on the microphone is required, and may be installed either (a) between receiver and transmitter, with a common coaxial line to the antenna, or (b) at the base of the antenna, switching between individual coaxial lines to the receiver and transmitter. The first method is generally preferred since it requires installation of but one coaxial line to the antenna, and eliminates the requirement of running two relay control wires to the base of the antenna, usually in the rear of the vehicle. Both methods are shown on Drawing No. 167, Fig. A and Fig. B in the appendix of this manual.

2.4 **POWER SUPPLY.** The MULTI-ELMAC PMR-6A receiver requires a filament voltage of 6.3 volts, either A.C. or D.C., at 3.6 amperes (or in the 12 volt model, 12.6 volts A.C. or D.C. at 1.8 amperes) and a "B" supply voltage of 250 volts at 90 milliamperes. The power supply may be located any place in the vehicle provided the "hot" 6 (or 12) volt supply lead is heavy enough to furnish the necessary current without undue voltage drop. Make sure that the case of the power supply is efficiently grounded to the car body. If this can not be done with the mounting bolts, a heavy copper braid ground strap must be provided. This insures sufficient voltage to the power supply and also eliminates the possibility of the receiver picking up vibrator hash noise. The power supply can be bolted to the fire wall either in the car or under the hood. Simple control circuits to permit the use of MULTI-ELMAC power supplies to supply both the receiver and the low level stages of companion transmitter are discussed in paragraph 2.7 and illustrated in Drawing No. 167. If other than an MULTI-ELMAC power supply is used and this power supply does not have filament filtering circuits incorporated, a Mallory type No. RF582 filament choke and a Mallory No. VO 480 condenser must be installed in the filament lead to the receiver.

2.5 **"S" METER.** Provision has been made for the attachment of an external "S" meter giving relative signal strength readings. A 0 to 1 milliampere meter is installed in one leg of a bridge circuit feeding the plate of the second 455 Kc. I.F. amplifier. Additional parts required are: 1—100 ohm resistor, 1—82,000 ohm resistor and 1—500 ohm potentiometer. These components are wired together and inserted into the circuit as shown on Drawing Nos. 153 B and 154B. The PSR-116S MULTI-ELMAC power supply is furnished complete with this "S" meter circuit and all connections made.

2.6 **RECEIVER CONTROLS.** For the convenience of the mobile operator, a minimum number of control knobs and switches are desirable. The MULTI-ELMAC PMR-6A receiver has five controls as shown on

Drawing No. 163, marked "A", "B", "C", "D", and "E", as follows:

Control "A"—Reception selector switch. This has four positions:

1. Normal phone reception, AVC *on*, automatic noise limiter *off*.
2. AVC *on*, noise limiter *on*.
3. AVC *off*, noise limiter *on*.
4. Noise limiter *on*, BFO *on*.

Control "B"—Antenna trimmer. Peak for each band.
Control "C"—Volume control and "on-off" switch.
Control "D"—Bandswitch.
Control "E"—Tuning knob.

2.7 CONTROL CIRCUITS. While this manual does not include within its scope general instruction on control systems for mobile installations, it is important for the user of the PMR-6A receiver to employ control circuits that will (a) protect the receiver from R.F. overload by disabling it during periods of transmission, (b) make the transmitter instantly inoperative when the send-switch is released, and (c) achieve a maximum economy of battery drain. A small single-pole double-throw relay, when using an MULTI-ELMAC power supply, will mute the receiver instantly when transmitting and make the transmitter inoperative as soon as the send-switch is released, as shown in Drawing No. 167. This system permits the use of the receiver power supply for both the receiver and the low level stages of the transmitter. By relieving some of the load on the transmitter dynamotor in this way, more power is available for the final amplifier stage and modulator of the transmitter. This also results in lower current drain by the dynamotor on the battery.

2.8 VEHICULAR NOISE SUPPRESSION. The proper utilization in a mobile installation of a good communications receiver such as the MULTI-ELMAC PMR-6A is possible only when vehicular noise has been effectively eliminated or suppressed. Many radio noises present in a vehicle can be eliminated at their source. Most other noises of local origin can be suppressed, using techniques well described in current literature. (See list of references at end of this paragraph.) After efficient noise suppression has been employed, it will be found that the automatic noise limiter built into the MULTI-ELMAC PMR-6A receiver will reduce all but the worst noise pulses to a level which will not interfere with satisfactory radio communication. It is particularly recommended that the following noise suppression be accomplished:

(1) Installation of spark plugs containing built-in 10,000 ohm suppressors, such as Auto-Lite; or installation of a good quality 10,000 ohm suppressors on each plug. ERIE model No. L7VR-10ME 10,000 ohm units are recommended.

(2) Installation of a .1 mfd coaxial condenser (SPRAGUE type 48P9 or 48P18) in series with the battery lead to the ignition coil. This should be mounted as close as possible to the coil input terminal, and a good ground made to the condenser case.

(3) Installation of a .1 mfd. coaxial condenser in the "hot" lead coming out of vehicle generator armature, replacing the normal automotive unit. This condenser must carry the normal charging current. A Sprague No. 48P18 unit will be suitable and is recommended. The condenser should be carefully grounded to the generator frame, cleaning off all paint and dirt with sandpaper.

(4) Installation of a .1 mfd. coaxial condenser between the battery terminal of the voltage regulator and ground, with the condenser case well grounded; installation of a similar condenser in the armature terminal on the voltage regulator, again with the case of the condenser well grounded, and installation of a .002 mfd. mica condenser in series with a 4 (four) ohm carbon resistor from the field terminal of the voltage regulator to ground.

(5) Residual noise remaining after the above precautions have been taken can be located by a process of elimination. In certain makes of automobiles, the various panel instruments radiate interference at radio frequencies which can be eliminated with appropriate by-pass condensers from the "hot" side of the offending instrument to ground. (See references listed below.)

THE RADIO AMATEUR'S HANDBOOK
RADIO HANDBOOK
CQ MOBILE HANDBOOK
QST Magazine—April, 1952 issue, page 17
QST Magazine—September, 1951 issue, page 59
CQ Magazine—May, 1952 issue, page 51
CQ Magazine—February, 1949 issue, page 30

SECTION 3.

Service and Alignment

3.1 GENERAL. Satisfactory operation of this receiver depends on several external factors. Before removing a receiver which is performing in an unsatisfactory manner, carefully inspect antenna connection, power cables and plugs, the storage battery and its connections (if a vehicular installation), the A.C. power source (if operated in a fixed location), and the speaker connections. It is an aggravating waste of time and effort to remove and attempt to service a receiver when the trouble is an external one.

(a) *Antenna.* If the receiver has its normal noise level, but signals are very weak, look for a broken antenna lead close to the receiver, or for an open or inoperative antenna relay.

(b) *Storage battery.* Check periodically the terminal voltage, specific gravity, level of electrolyte, and tightness of connections.

(c) *Cables and plugs.* The initial installation should locate all cables and plugs where they will not be exposed to physical shock or subjected to twisting and bending.

(d) *Fuses.* Check fuses with an ohmmeter. A good fuse has no appreciable resistance.

3.2 TUBES. Even though modern methods produce more reliable tubes than ever, the first source of trouble is most likely to be a defective tube. Tube failure will produce weak signals, intermittent operation, noise, or a completely dead receiver. When checking tubes, mark them as they are removed from the receiver so that they may be returned to their original sockets. Where a tube change is made in any circuit, that circuit should be re-aligned for peak performance as outlined in paragraphs 3.5 and 3.6. New tubes should be tapped while operating to check for microphonics, which will ruin operation of a mobile receiver.

3.3 CIRCUIT FAILURES. Excluding tubes, the most common source of circuit failure, will invariably be found in the dozens of resistors and capcitors within the receiver. A defective resistor or capacitor can usually be found by a point-to-point continuity test, although a careful visual inspection will often show the defective part, such as a charred resistor. The operating voltage and resistance chart shown on pages 13 and 14 permits a careful check of operating elements. The check should be made with a D.C. voltmeter of 20,000 ohms per volt sensitivity or a vacuum tube voltmeter. All measurements are taken with the antenna input shorted, switch "A" in normal position, bandswitch in band 2 position (75 meters), and a PSR-116S used as a power supply. (Any power supply can be used that will give the same "B" plus voltages.)

3.4 GENERAL ALIGNMENT INSTRUCTIONS. Thoroughly familiarize yourself with the layout of all coils as shown on Drawing No. 163 before beginning alignment. Some coils are located above the chassis and some are located under the chassis. This is done to use the natural shielding of the chassis between the R.F. coils and the converter coils. Check all brass slug adjusting screws to make sure that they are not worn so much that they will not hold their setting. If they are too worn to be serviceable they must be replaced.

Check the index line on the pointer to see that it is aligned properly with respect to the stops on the tuning dial. Check the plates of the tuning condenser to see if they have been badly bent out of shape. The small oscillator section may have the plates bent outward as the receiver comes from the factory for tracking purposes and should not be bent back into position. Before alignment, be sure you have an accurate signal generator. If at all possible, crystal oscillators that fall near the alignment frequencies specified below are to be preferred for maximum accuracy. The alignment of the receiver can never be more accurate than the signal generator with which it was aligned.

3.5 I.F. ALIGNMENT. Remove 6C4 oscillator tube.
Set bandswitch, in band 1 position (Broadcast and 160M).
Turn knob "A" to normal.
Set the signal generator to 455 kilocycles.
Connect the signal generator through a .001 mfd. mica condenser to the rear section of the tuning condenser.

Connect a vacuum tube voltmeter from the A.V.C. buss to ground. (If your receiver power supply is equipped with an "S" meter, the vacuum tube voltmeter is not necessary.)

If an "S" meter is not included and you do not have a vacuum tube voltmeter available, connect a 0 to 10 milliampere meter in series with the lead coming from pin No. 5 of the receiver power plug.

Adjust the slugs of I.F. transformers T3, T4, and T5 for maximum response, being careful to keep the output from the signal generator low enough to prevent overloading the receiver.

When the 455 kilocycle I.F. transformers have been peaked, turn on the B.F.O. (knob "A") and adjust T6 for zero beat.

To align the 1600 kilocycle I.F. stage, turn the bandswitch to band 2 position. (75 M.)

Set the signal generator to 1600 kilocycles.

Adjust the tuning slug of T1 (second conversion oscillator, located under the chassis) for maximum output.

Adjust the tuning slugs of I.F. transformer T2 for maximum output.

Replace 6C4 oscillator tube.

3.6 R.F. ALIGNMENT. Align band 6 (10 M.) first, then align bands 1, 2, 3, 4, and 5 in order. The local oscillator is on the high side of the signal on all bands except band 5. (15 M.)

Set knob "B" for half capacity.
Set bandswitch on band 6 (10 M.)
Set receiver dial at 29 megacycles.
Set signal generator at 29 megacycles.
Connect the signal generator through a 68 ohm carbon resistor to the antenna terminal on the receiver.
Adjust oscillator coil LO-10 until a signal is heard, and peak for maximum output.
Adjust LA-10 (under chassis) and LC-10 for maximum output.
Check oscillator tracking at 28 and 29.7 magacycles. If these frequencies fall short of the band edges, spread the plates of the small section of the oscillator main tuning condenser slightly and re-align at 29 megacycles, and again check the tracking. If 28 and 29.7 megacycles can not be reached with the tuning condenser, squeeze the plates of the oscillator tuning condenser together slightly and re-align as above.

Next align band 1 (broadcast and 160 M).
Set knob "B" at half capacity.
Set bandswitch on band 1.
Set signal generator at 800 kilocycles.
Set receiver dial at 800 kilocycles.
Adjust coil LO-160 (under chassis) until the signal is heard, and peak for maximum output.
Adjust coils LA-160 and LC-160 (under chassis) for maximum output.
Set signal generator at 1800 kilocycles.
Set receiver dial at 1800 kilocycles.
Adjust condenser C30-1 for maximum output.
Adjust condenser C20-1 for maximum output.
Re-check 800 kilocycle setting. (These two adjustments may have to be repeated several times until proper tracking is achieved.)

To align band 2 (75 M).
Set bandswitch on band 2.
Set knob "B" at half capacity.
Set signal generator at 3.5 megacycles.
Set receiver dial at 3.5 megacycles.
Adjust coil LO-80 until signal is heard, and peak for maximum output.
Adjust coil slugs LA-80 (under chassis) and LC-80 for maximum output.
Set signal generator at 4.0 megacycles.
Set receiver dial at 4.0 megacycles.
Adjust condenser C30-2 (under chassis) for maximum output.
Adjust condenser C20-2 (under chassis) for maximum output.
Recheck 3.5 megacycles. (These two adjustments may have to be repeated several times until proper tracking is achieved.)

To align band 3 (40 M).
Set bandswitch on band 3.
Set knob "B" at half capacity.
Set signal generator at 7.2 megacycles.
Set receiver dial at 7.2 megacycles.
Adjust coil slug LO-40 (under chassis) until signal is heard, and peak for maximum output.
Adjust coil slugs LA-40 and LC-40 (under chassis) for maximum output.

To align band 4 (20 M).
Set bandswitch on band 4.
Set knob "B" at half capacity.
Set signal generator at 14.2 megacycles.
Set receiver dial at 14.2 megacycles.
Adjust coil slug LO-20 until signal is heard, and peak for maximum output.
Adjust coil slugs LA-20 (under chassis) and LC-20 for maximum output.

To align band 5 (15 M).
Set bandswitch on band 5.
Set knob "B" at half capacity.
Set signal generator at 21.2 megacycles.
Set receiver dial at 21.2 megacycles.
Adjust coil slug LO-15 (under chassis) until signal is heard, and peak for maximum output.
Adjust coil slugs LA-15 and LC-15 (under chassis) for maximum output.

Notes: When going through the above alignment procedure keep in mind that the oscillator is on the high side of the signal on all bands except band 5 (15 M).

On bands 1 and 2 it is impossible to tune the oscillator to the wrong side of the signal. As a check, turn the signal generator to a frequency of 3.2 megacycles *higher* and the image should be heard. The signal generator output will have to be increased for this test. On band 5 the image will be 3.2 megacycles *lower* than the signal. For example, when band 4 is aligned and the signal generator is set at 14.2 megacycles, the image signal should be heard if the signal generator is set at 17.4 megacycles with the receiver left at 14.2 megacycles.

3.7 "S" METER ADJUSTMENT. Remove antenna and short input jack with piece of bare wire. Adjust potentiometer R-303 until "S" meter reads zero under this zero-signal condition. The "S" meter should read zero when the receiver is turned off. If not, adjust to zero with panel screw adjustment on the meter.

SECTION 4.

Appendix

4.1 PARTS LIST

C1	.005 mfd. ceramic. Centralab No. DD502.
C2	.005 mfd. ceramic. Centralab No. DD502.
C3	.005 mfd. ceramic. Centralab No. DD502.
C4	.005 mfd. ceramic. Centralab No. DD502.
C5	.005 mfd. ceramic. Centralab No. DD502.
C6	.005 mfd. ceramic. Centralab No. DD502.
C7	.002 mfd. ceramic. Centralab No. DD202.
C8	.01 mfd. ceramic. Centralab No. DD1032.
C9	Main tuning condenser. Radio Condenser Co. No. 61-058.
C10	25 mmf. antenna trimmer. A.S.P. No. CT1-0-024.
C10-3	75 mmf. NPO ceramic. Centralab No. TCZ-75.
C10-4	150 mmf. NPO ceramic. Centralab No. TCZ-150.
C10-5	150 mmf. NPO ceramic. Centralab No. TCZ-150.
C10-6	56 mmf. NPO ceramic. Centralab No. TCZ-56.
C11	.005 mfd. ceramic. Centralab No. DD502.
C12	.005 mfd. ceramic. Centralab No. DD502.
C13	.005 mfd. ceramic. Centralab No. DD502.
C14	.005 mfd. ceramic. Centralab No. DD502.
C20-1	5 to 25 mmf. ceramic variable. Centralab No. 822-AZ.
C20-2	5 to 25 mmf. ceramic variable. Centralab No. 822-AZ.
C20-3	75 mmf. NPO ceramic. Centralab No. TCZ-75.
C20-4	150 mmf. NPO ceramic. Centralab No. TCZ-150.
C20-5	150 mmf. NPO ceramic. Centralab No. TCZ-150.
C20-6	75 mmf. NPO ceramic. Centralab No. TCZ-75.
C21	.005 mfd. ceramic. Centralab No. DD502.
C22	.005 mfd. ceramic. Centralab No. DD502.
C23	.005 mfd. ceramic. Centralab No. DD502.
C24	.005 mfd. ceramic. Centralab No. DD502.
C25	10 mmf. NPO ceramic. Centralab No. TCZ-10.
C26	10 mmf. NPO ceramic Centralab No. TCZ-10.
C30-1	5 to 25 mmf. ceramic variable. Centralab No. 822-AZ.
C30-2	5 to 25 mmf. ceramic variable. Centralab No. 822-AZ.
C30-3	68 mmf. NPO ceramic. Centralab No. TCZ-68.
C30-4	150 mmf. NPO ceramic. Centralab No. TCZ-150.
C30-5	120 mmf. NPO ceramic. Centralab No. TCZ-120.
C30-6	68 mmf. NPO ceramic. Centralab No. TCZ-68.
C30-12	5 mmf. N750 ceramic. Centralab No. TCN-5.
C30-13	10 mmf. N750 ceramic. Centralab No. TCN-10.
C30-14	12 mmf. N750 ceramic. Centralab No. TCN-12.
C30-15	22 mmf. N750 ceramic. Centralab No. TCN-22.
C30-16	10 mmf. N750 ceramic. Centralab No. TCN-10.
C33	75 mmf. NPO ceramic. Centralab No. TCZ-75.
C34	.05 mfd. ceramic. Centralab No. DF-503.
C42	.005 mfd. ceramic. Centralab No. DD-502.
C43	75 mmf. NPO ceramic. Centralab No. TCZ-75.
C44	.005 mfd. ceramic. Centralab No. DD-502.
C52	.005 mfd. ceramic. Centralab No. DD-502.
C53	.005 mfd. ceramic. Centralab No. DD-502.
C54	.005 mfd. ceramic. Centralab No. DD-502.
C62	.005 mfd. ceramic. Centralab No. DD-502.
C63	.005 mfd. ceramic. Centralab No. DD-502.
C64	.005 mfd. ceramic. Centralab No. DD-502.
C71	100 mmf. GP ceramic. Centralab No. D6-101.

C72	.01 mfd. ceramic.	Centralab No. DD-1032.
C73	.002 mfd. ceramic.	Centralab No. DD-202.
C81	10 mfd. 50 volt electrolytic.	Mallory No. TC-32.
C83	75 mmf. NPO ceramic.	Centralab No. TCZ-75.
C84	.005 mfd. ceramic.	Centralab No. DD-502.
C91	10 mfd. 50 volt electrolytic.	Mallory No. TC-32.
C93	.01 mfd. ceramic.	Centralab No. DD-1032
C94	.005 mfd. ceramic.	Centralab No. DD-502
C101	10 mfd. 450 volt	C-D No. UP-15D145 or Sangamo No. PLT-741
C102	15 mfd. 450 volt	
C103	15 mfd. 450 volt	
C104	250 mmf. GP ceramic.	Centralab No. D6-251.
C105	.005 mfd. 1600 volt ceramic.	Centralab No. DD16-502
C106	.5 mfd. 120 volt.	Mallory No. VO-480.
C107	.5 mfd. 120 volt.	Mallory No. VO-480.
C108	250 mmf. GP ceramic.	Centralab No. D6-251.
C109	250 mmf. GP ceramic.	Centralab No. D6-251.
C110	.5 mfd. 120 volt.	Mallory No. VO-480.
C201	10 mfd. 450 volt	C-D No. UP-15D145 or Sangamo No. PLT-741
C202	15 mfd. 450 volt	
C203	15 mfd. 450 volt	

R11	68	Ohm	½ Watt	Carbon	Resistor
R12	33,000	Ohm	½ Watt	Carbon	Resistor
R13	100,000	Ohm	½ Watt	Carbon	Resistor
R14	1,000	Ohm	½ Watt	Carbon	Resistor
R21	150	Ohm	½ Watt	Carbon	Resistor
R22	22,000	Ohm	1 Watt	Carbon	Resistor
R23	100,000	Ohm	½ Watt	Carbon	Resistor
R24	1,000	Ohm	½ Watt	Carbon	Resistor
R25	47,000	Ohm	1 Watt	Carbon	Resistor
R33	47,000	Ohm	1 Watt	Carbon	Resistor
R42	22,000	Ohm	1 Watt	Carbon	Resistor
R43	150,000	Ohm	1 Watt	Carbon	Resistor
R44	1,000	Ohm	½ Watt	Carbon	Resistor
R51	470	Ohm	½ Watt	Carbon	Resistor
R52	47,000	Ohm	½ Watt	Carbon	Resistor
R53	100,000	Ohm	½ Watt	Carbon	Resistor
R54	1,000	Ohm	½ Watt	Carbon	Resistor
R61	**470**	Ohm	½ Watt	Carbon	Resistor
R62	47,000	Ohm	½ Watt	Carbon	Resistor
R63	100,000	Ohm	½ Watt	Carbon	Resistor
R64	1,000	Ohm	½ Watt	Carbon	Resistor
R72	560,000	Ohm	½ Watt	Carbon	Resistor
R73	1 megohm		½ Watt	Carbon	Resistor
R74	220,000	Ohm	½ Watt	Carbon	Resistor
R75	330,000	Ohm	½ Watt	Carbon	Resistor
R76	1.2 megohm		½ Watt	Carbon	Resistor
R81	1,000	Ohm	½ Watt	Carbon	Resistor
R83	47,000	Ohm	½ Watt	Carbon	Resistor
R84	100,000	Ohm	½ Watt	Carbon	Resistor
R85	220,000	Ohm	½ Watt	Carbon	Resistor
R86	500,000	Ohm	Potentiometer and switch.	I.R.C. No. 13-133.	
R87	**47,000**	Ohm	½ Watt	Carbon	Resistor
R91	180	Ohm	1 Watt	Carbon	Resistor
R93	470,000	Ohm	½ Watt	Carbon	Resistor
R101	10,000	Ohm	10 Watt	Wire wound	Resistor
R102	600	Ohm	10 Watt	Wire wound	Resistor
R103	68	Ohm	½ Watt	Carbon	Resistor (6 volt supply)

R103	150	Ohm	½ Watt	Carbon	Resistor (12 volt supply)
R104	68	Ohm	½ Watt	Carbon	Resistor (6 volt supply)
R104	150	Ohm	½ Watt	Carbon	Resistor (12 volt supply)
R105	5,100	Ohm	1 Watt	Carbon	Resistor
R201	10,000	Ohm	10 Watt	Wire wound	Resistor
R202	600	Ohm	10 Watt	Wire wound	Resistor
R301	82,000	Ohm	2 Watt	Carbon	Resistor
R302	100	Ohm	1 Watt	Carbon	Resistor
R303	500	Ohm	Potentiometer I.R.C. No. W500.		

T1	2055 KC Second conversion osc. coil.
T2	1600 KC input IF transformer.
T3	455 KC input IF transformer.
T4	455 KC interstage IF transformer.
T5	455 KC output IF transformer.
T6	455 KC B.F.O. coil.
T7	Audio output transformer (6500 ohm to 3.2 ohm) No. 121A6.
T101	Vibrator transformer for 6 volts. No. 121P4.
T101	Vibrator transformer for 12 volts. No. 121P5.
T201	115 volt, 60 cycle power transformer. No. 121P7.

V1	6BJ6	R.F. amplifier.
V2	6BE6/6BA7	First converter.
V3	6C4	H.F. oscillator.
V4	6BE6	Second converter-oscillator.
V5	6BA6	First I.F. amplifier.
V6	6BA6	Second I.F. amplifier.
V7	6AL5	Detector, AVC rectifier, noise limiter.
V8	12AT7	First audio amplifier, B.F. oscillator.
V9	6BK5	Audio frequency output.
V10	OB2	Voltage regulator.
V101	6X4	Rectifier (6 volt supply)
V101	12X4	Rectifier (12 volt supply)
V201	6X4	Rectifier (A.C. supply)

S1	Bandswitch. Centralab No. 022-QS149.
S2	Noise limiter, AVC, BFO switch. Mallory No. 3234J.
S3	"On-Off" switch on R86. I.R.C. No. 76-1.
L1	.82 Microhenry choke.
L101	Filter choke. 8 henry at 90 Ma. No. 121C2.
L201	Filter choke. 8 henry at 90 Ma. No. 121C2.
L102	Hash choke. Mallory No. 582.
L103	Hash choke. Mallory No. 583.

VIB.	Vibrator, 6 volt. Mallory No. 659 or 859.
VIB.	Vibrator, 12 volt. Mallory No. G659.

UCS	Utility and control socket, used for receiver muting and connecting the low level stages of a companion transmitter.

4.2 RESISTANCE CHART

TUBE PIN No. → / TUBE No. ↓		1	2	3	4	5	6	7	8	9
V1	6BJ6	1.9 meg.	68 ohm	.3 ohm (3.5 ohm)	zero (1 ohm)	Inf.	Inf.	zero	—	—
V2	6BE6	47K ohm	150 ohm	.3 ohm (2 ohm)	zero (zero)	Inf.	Inf.	1.8 meg.	—	—
	6BA7	Inf.	47K ohm	150 ohm	zero (zero)	.3 ohm (2 ohm)	zero	1.8 meg.	zero	Inf.
V3	6C4	Inf.	Inf.	.3 ohm (3.5 ohm)	zero (zero)	Inf.	47K ohm	zero	—	—
V4	6BE6	22K ohm	.2 ohm	.3 ohm (2 ohm)	zero (1 ohm)	Inf.	Inf.	3.0 ohm	—	—
V5	6BA6	1.8 meg.	zero	.3 ohm (.6 ohm)	zero (zero)	Inf.	Inf.	470 ohm	—	—
V6	6BA6	1.8 meg.	zero	.3 ohm (.6 ohm)	zero (zero)	Inf.	Inf.	470 ohm	—	—
V7	6AL5	330K ohm	560K ohm	.3 ohm (.6 ohm)	zero (zero)	zero	zero	330K ohm	—	—
V8	12AT7	Inf.	47K ohm	2.8 ohm	zero (zero)	zero (zero)	Inf.	*zero to 500K ohms	1,000	.3 ohm (.6 ohm)
V9	6BK5	Inf.	—	470K ohm	.3 ohm (.6 ohm)	zero (1 ohm)	180 ohm	470K ohm	Inf.	Inf.
V10	0B2	Inf.	zero	—	zero	Inf.	—	zero	—	—
Plug		zero	.3 ohm (1. ohm)	Inf.	Inf.	Inf.	Inf.	Inf.	Inf.	—

All resistance measurements are taken with power plug removed. Bandswitch in band 2 (75 M) position. Knob "A" in "normal" position, and all tubes in their sockets.

Resistance values in brackets refer to 12 volt models.
Resistance values may vary 20%.
*Depends on volume control setting.

4.3 VOLTAGE CHART

TUBE PIN No. →		1	2	3	4	5	6	7	8	9
TUBE No. ↓										
V1	6BJ6	−1.7 V.*	+1 V.	6.3@	zero (12.6)@	+250 V.	+135 V.	zero	—	—
V2	6BE6	−11 V.*	+1 V.	6.3@	zero	+250 V.	+100 V.	−1.7 V.*	—	—
	6BA7	+76 V.	−11 V.*	+1.3 V.	zero	6.3@	zero	−1.7 V.*	zero	+250 V.
V3	6C4	+105 V.	zero	6.3@	zero	+105 V.	−15.V.*	zero	—	—
V4	6BE6	−5.V.*	zero	6.3@	zero (12.6)@	+250 V.	+50 V.	zero	—	—
V5	6BA6	−1.7 V.*	zero	6.3@	zero	+250 V.	+130 V.	+4.V.	—	—
V6	6BA6	−1.7 V.*	zero	6.3@	zero	+250 V.	+130 V.	+4.V.	—	—
V7	6AL5	−1.3 V.*	Do not measure	6.3@	zero	zero	zero	−1.3 V.*	—	—
V8	12AT7	—	—	—	zero	zero	+65 V.	zero	+.9 V.*	6.3@
V9	6BK5	+260 V.	zero	zero	6.3@	zero (12.6)@	+5.5 V.	zero	+250 V.	+265 V.
V10	0B2	+105 V.	zero	zero	zero	+105 V.	zero	zero	—	—
Plug		zero	6.3@ (12.6)@	+265 V.	+250 V.	+250 V.	+105 V.	Do not measure	Do not measure	—

All measurements taken using a PSR-116 power supply or equivalent, with 115 volt supply. Band switch in band 2 (75 M) position. Knob "A" in "normal" position. Antenna input shorted, and volume control on minimum.

@ Either A.C. or D.C. Brackets refer to 12 volt model.
*Can be measured only with a vacuum-tube voltmeter. All others with 20,000 ohms/volt meter.

4.4 WARRANTY. This receiver has been carefully tested and was shipped from the factory in perfect operating condition. If the set arrives damaged in transit, it is important that you file claim immediately against the carrier.

THE MULTI-PRODUCTS COMPANY, warranting this receiver to be free from defective materials and workmanship, agrees to repair or replace, without charge, any defective part or accessory provided notice of the claimed defect is given the manufacturer within 90 (Ninety) days of the date of sale to the original purchaser. Any part returned to the manufacturer shall be shipped prepaid by the owner. Any failure of the equipment following modification by the user, or occurring through application of power supply voltages other than those specified in this instruction manual shall not constitute a defect within this warranty.

This warranty shall not become effective until the Owner's Registration Card supplied with the equipment has been filled out and mailed to the manufacturer. Please fill out and mail this card promptly.

The manufacturer reserves the right to make any changes in this receiver without obligating itself with respect to prior production.

SERVICE NOTES

R103	150	Ohm	½ Watt	Carbon	Resistor (12 volt supply)
R104	68	Ohm	½ Watt	Carbon	Resistor (6 volt supply)
R104	150	Ohm	½ Watt	Carbon	Resistor (12 volt supply)
R105	5,100	Ohm	1 Watt	Carbon	Resistor
R201	10,000	Ohm	10 Watt	Wire wound	Resistor
R202	600	Ohm	10 Watt	Wire wound	Resistor
R301	82,000	Ohm	2 Watt	Carbon	Resistor
R302	100	Ohm	1 Watt	Carbon	Resistor
R303	500	Ohm	Potentiometer I.R.C. No. W500.		

T1	2055 KC Second conversion osc. coil.
T2	1600 KC input IF transformer.
T3	455 KC input IF transformer.
T4	455 KC interstage IF transformer.
T5	455 KC output IF transformer.
T6	455 KC B.F.O. coil.
T7	Audio output transformer (6500 ohm to 3.2 ohm) No. 121A6.
T101	Vibrator transformer for 6 volts. No. 121P4.
T101	Vibrator transformer for 12 volts. No. 121P5.
T201	115 volt, 60 cycle power transformer. No. 121P7.

V1	6BJ6	R.F. amplifier.
V2	6BE6/6BA7	First converter.
V3	6C4	H.F. oscillator.
V4	6BE6	Second converter-oscillator.
V5	6BA6	First I.F. amplifier.
V6	6BA6	Second I.F. amplifier.
V7	6AL5	Detector, AVC rectifier, noise limiter.
V8	12AT7	First audio amplifier, B.F. oscillator.
V9	6BK5	Audio frequency output.
V10	OB2	Voltage regulator.
V101	6X4	Rectifier (6 volt supply)
V101	12X4	Rectifier (12 volt supply)
V201	6X4	Rectifier (A.C. supply)

S1	Bandswitch. Centralab No. 022-QS149.
S2	Noise limiter, AVC, BFO switch. Mallory No. 3234J.
S3	"On-Off" switch on R86. I.R.C. No. 76-1.
L1	.82 Microhenry choke.
L101	Filter choke. 8 henry at 90 Ma. No. 121C2.
L201	Filter choke. 8 henry at 90 Ma. No. 121C2.
L102	Hash choke. Mallory No. 582.
L103	Hash choke. Mallory No. 583.

VIB.	Vibrator, 6 volt. Mallory No. 659 or 859.
VIB.	Vibrator, 12 volt. Mallory No. G659.

UCS	Utility and control socket, used for receiver muting and connecting the low level stages of a companion transmitter.

C72	.01 mfd. ceramic. Centralab No. DD-1032.	
C73	.002 mfd. ceramic. Centralab No. DD-202.	
C81	10 mfd. 50 volt electrolytic. Mallory No. TC-32.	
C83	75 mmf. NPO ceramic. Centralab No. TCZ-75.	
C84	.005 mfd. ceramic. Centralab No. DD-502.	
C91	10 mfd. 50 volt electrolytic. Mallory No. TC-32.	
C93	.01 mfd. ceramic. Centralab No. DD-1032	
C94	.005 mfd. ceramic. Centralab No. DD-502	
C101	10 mfd. 450 volt	C-D No. UP-15D145 or Sangamo No. PLT-741
C102	15 mfd. 450 volt	
C103	15 mfd. 450 volt	
C104	250 mmf. GP ceramic. Centralab No. D6-251.	
C105	.005 mfd. 1600 volt ceramic. Centralab No. DD16-502	
C106	.5 mfd. 120 volt. Mallory No. VO-480.	
C107	.5 mfd. 120 volt. Mallory No. VO-480.	
C108	250 mmf. GP ceramic. Centralab No. D6-251.	
C109	250 mmf. GP ceramic. Centralab No. D6-251.	
C110	.5 mfd. 120 volt. Mallory No. VO-480.	
C201	10 mfd. 450 volt	C-D No. UP-15D145 or Sangamo No. PLT-741
C202	15 mfd. 450 volt	
C203	15 mfd. 450 volt	

R11	68	Ohm	½ Watt	Carbon	Resistor
R12	33,000	Ohm	½ Watt	Carbon	Resistor
R13	100,000	Ohm	½ Watt	Carbon	Resistor
R14	1,000	Ohm	½ Watt	Carbon	Resistor
R21	150	Ohm	½ Watt	Carbon	Resistor
R22	22,000	Ohm	1 Watt	Carbon	Resistor
R23	100,000	Ohm	½ Watt	Carbon	Resistor
R24	1,000	Ohm	½ Watt	Carbon	Resistor
R25	47,000	Ohm	1 Watt	Carbon	Resistor
R33	47,000	Ohm	1 Watt	Carbon	Resistor
R42	22,000	Ohm	1 Watt	Carbon	Resistor
R43	150,000	Ohm	1 Watt	Carbon	Resistor
R44	1,000	Ohm	½ Watt	Carbon	Resistor
R51	470	Ohm	½ Watt	Carbon	Resistor
R52	47,000	Ohm	½ Watt	Carbon	Resistor
R53	100,000	Ohm	½ Watt	Carbon	Resistor
R54	1,000	Ohm	½ Watt	Carbon	Resistor
R61	**470**	Ohm	½ Watt	Carbon	Resistor
R62	47,000	Ohm	½ Watt	Carbon	Resistor
R63	100,000	Ohm	½ Watt	Carbon	Resistor
R64	1,000	Ohm	½ Watt	Carbon	Resistor
R72	560,000	Ohm	½ Watt	Carbon	Resistor
R73	1 megohm		½ Watt	Carbon	Resistor
R74	220,000	Ohm	½ Watt	Carbon	Resistor
R75	330,000	Ohm	½ Watt	Carbon	Resistor
R76	1.2 megohm		½ Watt	Carbon	Resistor
R81	1,000	Ohm	½ Watt	Carbon	Resistor
R83	47,000	Ohm	½ Watt	Carbon	Resistor
R84	100,000	Ohm	½ Watt	Carbon	Resistor
R85	220,000	Ohm	½ Watt	Carbon	Resistor
R86	500,000	Ohm	Potentiometer and switch. I.R.C. No. 13-133.		
R87	**47,000**	Ohm	½ Watt	Carbon	Resistor
R91	180	Ohm	1 Watt	Carbon	Resistor
R93	470,000	Ohm	½ Watt	Carbon	Resistor
R101	10,000	Ohm	10 Watt	Wire wound	Resistor
R102	600	Ohm	10 Watt	Wire wound	Resistor
R103	68	Ohm	½ Watt	Carbon	Resistor (6 volt supply)

PARTS LIST

T1 —Filament transformer Part #121P8
T2 —Plate transformer Part #121P6
V1 —6X5GT tube
V2 —5U4G tube
C1 —8 mfd. 600 volt electrolytic condenser
C2 —8 mfd. 600 volt electrolytic condenser
C3 —15 mfd. 450 volt electrolytic condenser
C4 —25 mfd. 450 volt electrolytic condenser
CH1—8 henry 250 ma. choke Part #121C11
CH2—8 henry 250 ma. choke Part #121C11
CH3—8 henry 100 ma. choke Part #121C2
R1 —15K ohm 50 watt resistor
R2 —600 ohm 10 watt resistor
R3 —25K ohm 10 watt resistor
F —5 amp. fuse
G1 —General Electric 1N91 Fused junction germanium rectifier
C5 —50 mfd. 50 volt electrolytic condenser
R —KR5D 24 volt DC coil SPDT Potter Brumfield relay

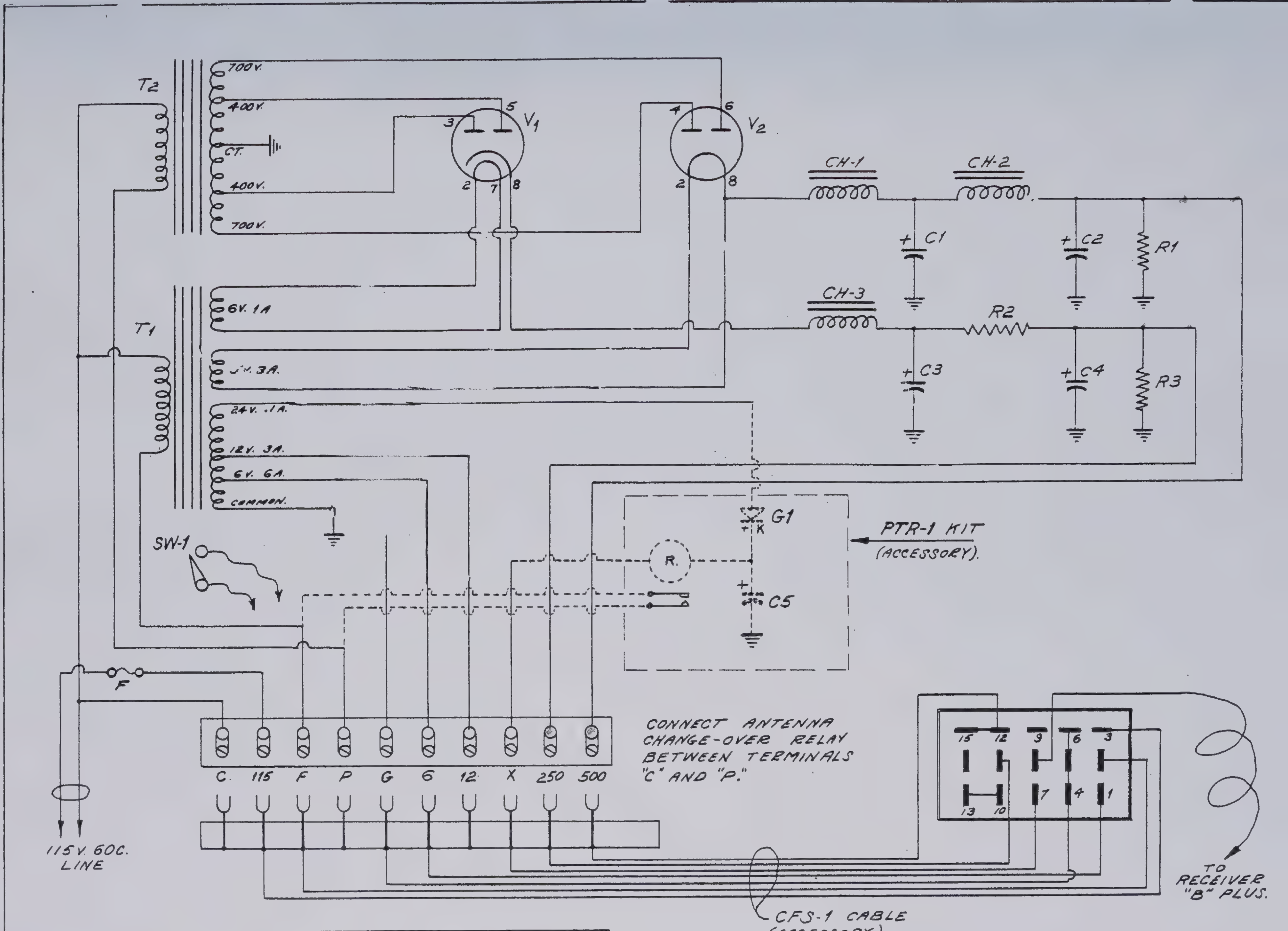
WARRANTY

This power supply has been carefully tested and was shipped from the factory in perfect operating condition. If the unit arrives damaged in transit, it is important that you file claim immediately with the carrier.

THE MULTI-PRODUCTS COMPANY, warranting this power supply to be free from defective materials and workmanship, agrees to repair or replace, without charge, any part or accessory within 90 (ninety) days of the date of sale to the original purchaser. Letter of explanation must precede any article returned under this warranty. Any [illegible] to the manufacturer shall be shipped prepaid by the owner. Any failure of the [illegible]ving modification by the user, or occuring through application of voltages other th[illegible]y these instructions shall not constitute a defect within this warranty.

The manufacturer reserves the right to make any changes to this unit without obligating itself with respect to prior production.

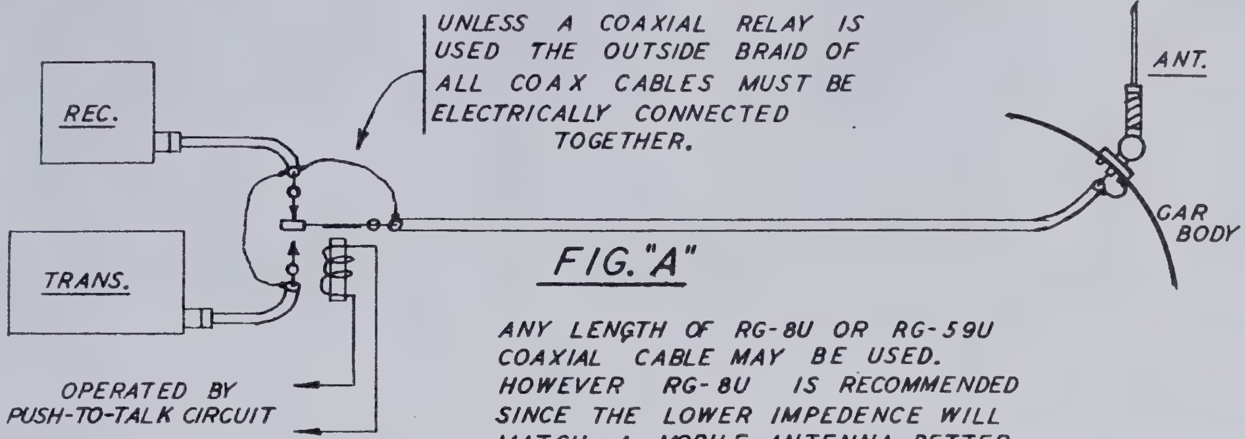
This warranty shall not be in effect if the owners registration card is not properly filled out as to model no., serial no., date purchased, from whom purchased, and forwarded to the MULTI-PRODUCTS COMPANY.



CONNECT ANTENNA
CHANGE-OVER RELAY
BETWEEN TERMINALS
"C" AND "P."

MULTI-PRODUCTS CO.	PS-2V POWER SUPPLY	224
DRWN. G.E.U. 11-3-53		

4.7



UNLESS A COAXIAL RELAY IS USED THE OUTSIDE BRAID OF ALL COAX CABLES MUST BE ELECTRICALLY CONNECTED TOGETHER.

FIG. "A"

ANY LENGTH OF RG-8U OR RG-59U COAXIAL CABLE MAY BE USED. HOWEVER RG-8U IS RECOMMENDED SINCE THE LOWER IMPEDENCE WILL MATCH A MOBILE ANTENNA BETTER.

OPERATED BY PUSH-TO-TALK CIRCUIT

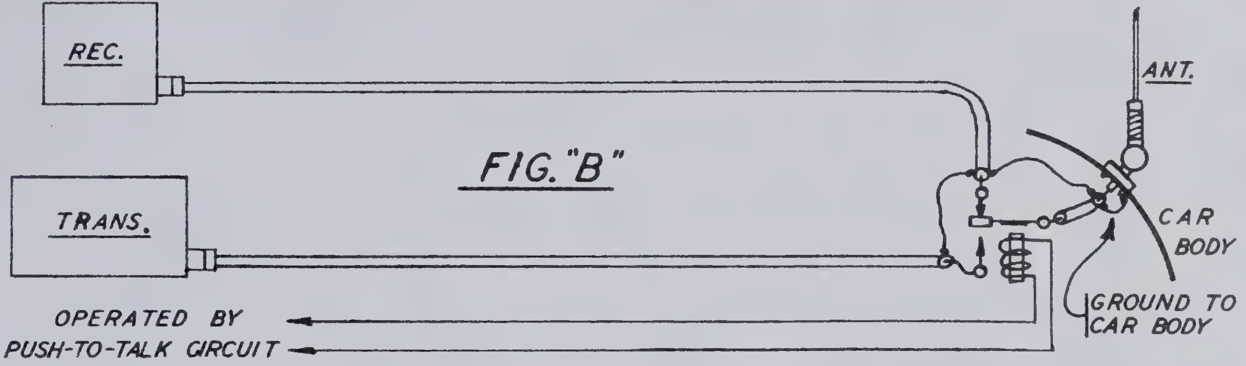
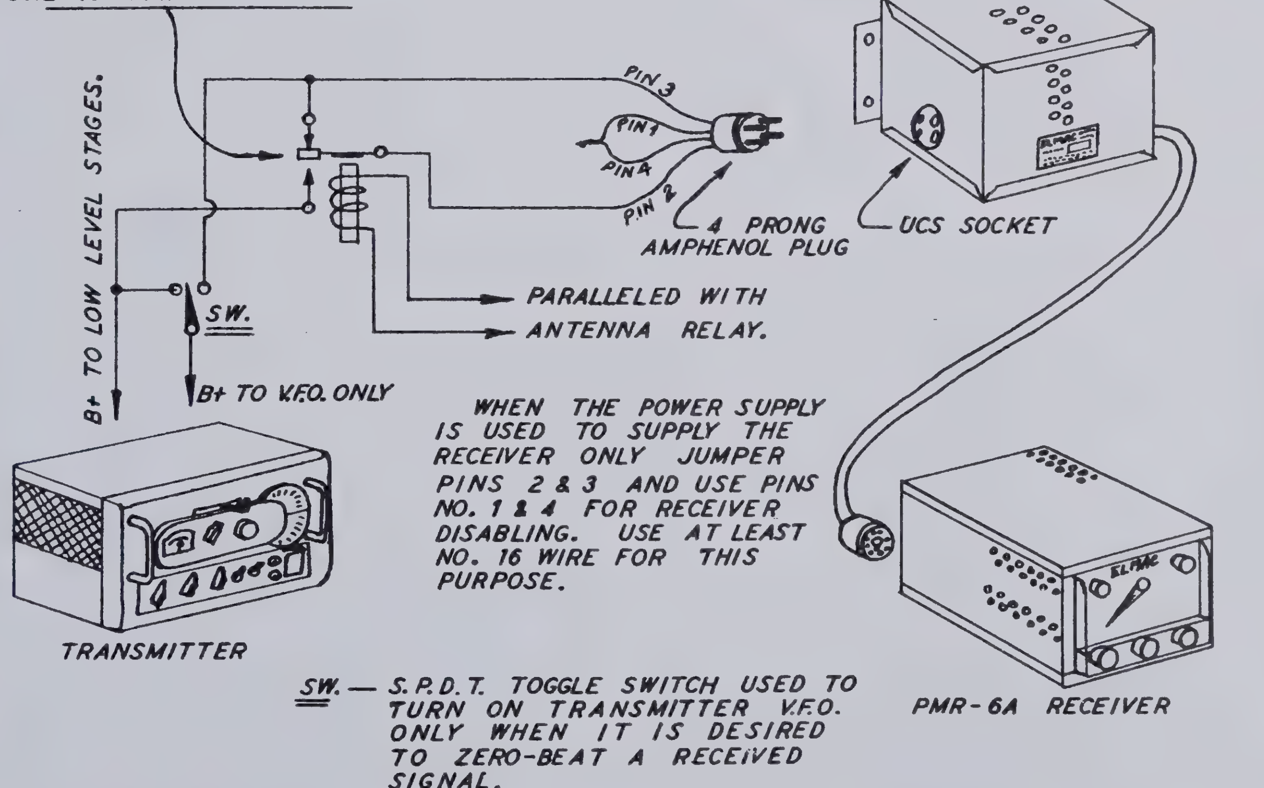


FIG. "B"

OPERATED BY PUSH-TO-TALK CIRCUIT

SMALL S.P.D.T. RELAY OR THE AUXILIARY CONTACTS OF THE COAXIAL ANTENNA RELAY IF ONE IS USED.

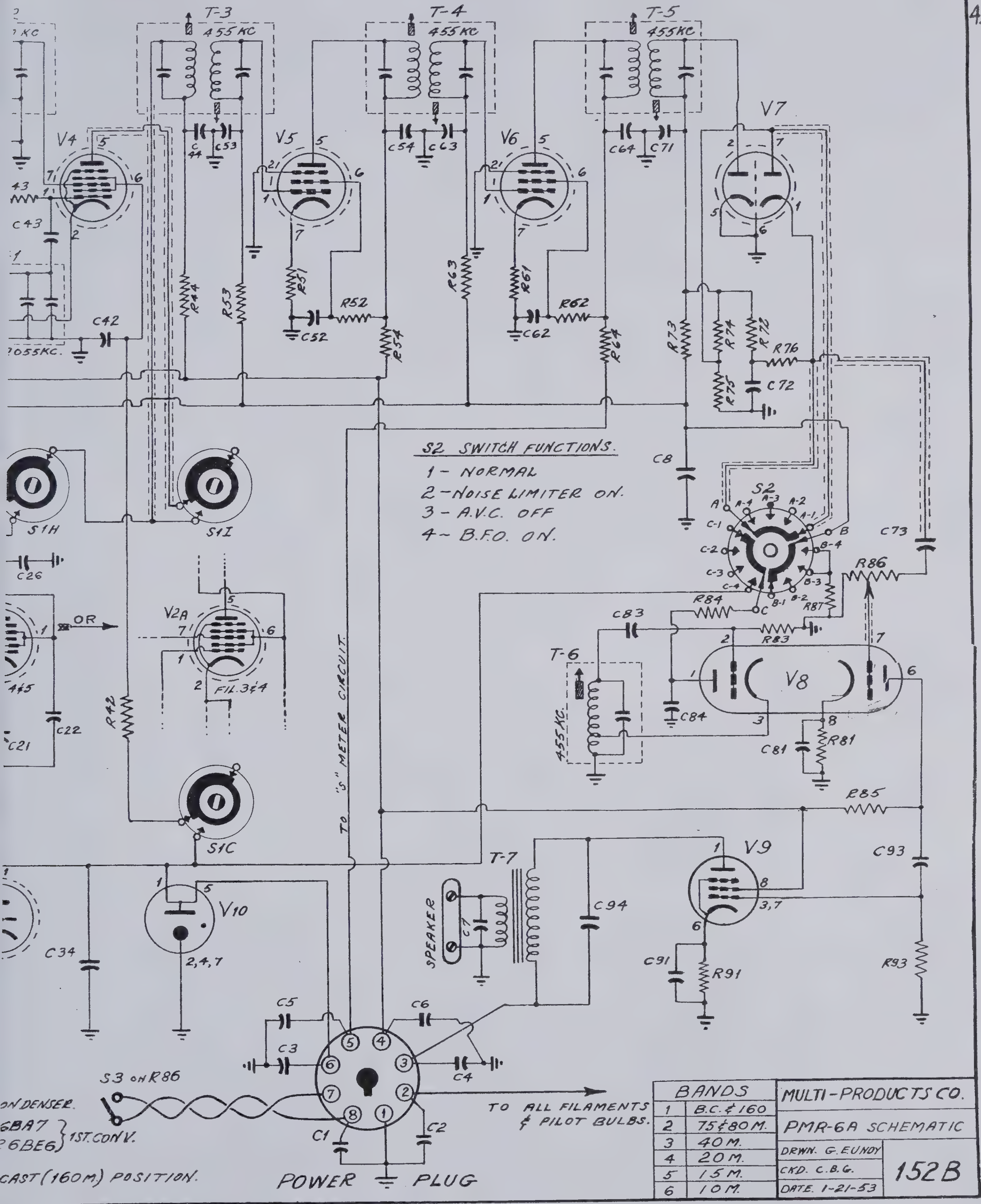
ELMAC PSR-6, PSR-12, OR PSR-116 POWER SUPPLY



WHEN THE POWER SUPPLY IS USED TO SUPPLY THE RECEIVER ONLY JUMPER PINS 2 & 3 AND USE PINS NO. 1 & 4 FOR RECEIVER DISABLING. USE AT LEAST NO. 16 WIRE FOR THIS PURPOSE.

SW. — S.P.D.T. TOGGLE SWITCH USED TO TURN ON TRANSMITTER V.F.O. ONLY WHEN IT IS DESIRED TO ZERO-BEAT A RECEIVED SIGNAL.

DRWG. NO. 167



S2 SWITCH FUNCTIONS.

1 - NORMAL
2 - NOISE LIMITER ON.
3 - A.V.C. OFF
4 - B.F.O. ON.

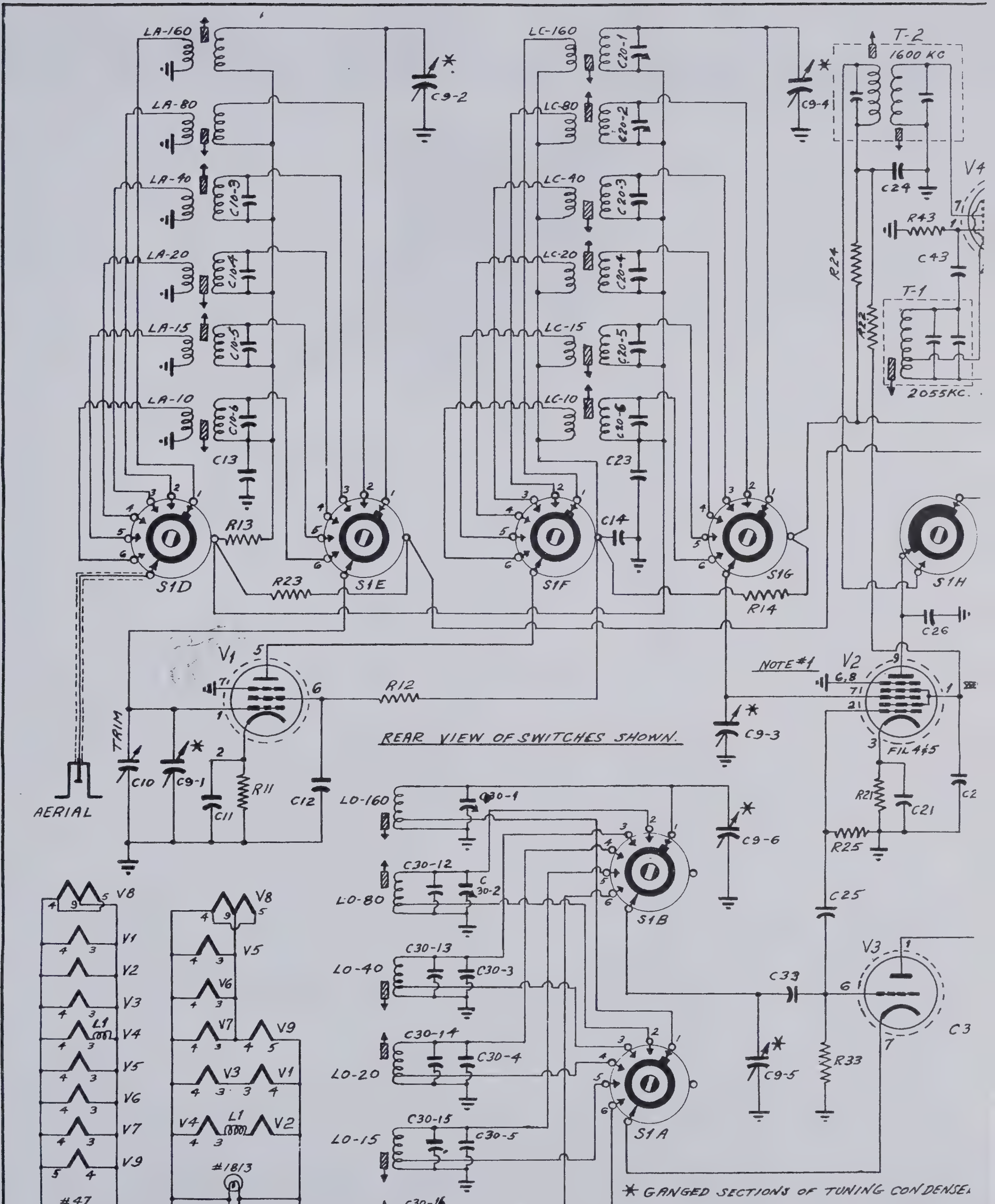
BANDS	
1	B.C. & 160
2	75 & 80 M.
3	40 M.
4	20 M.
5	15 M.
6	10 M.

MULTI-PRODUCTS CO.

PMR-6A SCHEMATIC

DRWN. G. EUNDY
CKD. C.B.G.
DATE. 1-21-53

152 B



REAR VIEW OF SWITCHES SHOWN.

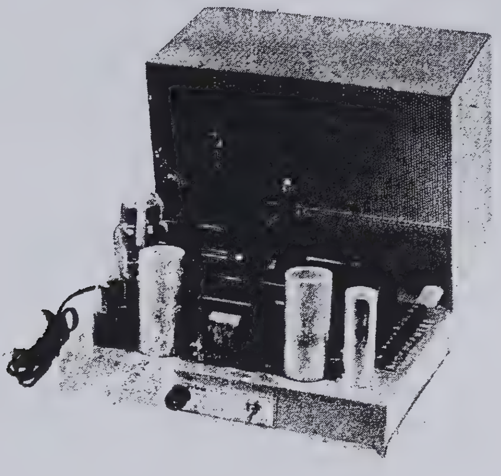
* GANGED SECTIONS OF TUNING CONDENSE

NOTE #1 V2-CONNECTIONS FOR 6BA7 }
V2A-CONNECTIONS FOR 6BE6}

NOTE #2 BANDSWITCH IN BROADCAST (1

MULTI-ELMAC POWER SUPPLY

MODEL
PS-2V



115 VOLT
60 CYCLE

A UNIVERSAL POWER SUPPLY

Designed to be used with the MULTI-ELMAC AF-67 Trans-citer
or a variety of other applications.

SPECIFICATIONS

- 6V. @ 6A. or 12V. @ 3A. AC for filaments.
- 230 volts @ 80 ma. DC output.
- 475 volts @ 170 ma. DC output.
- Separate filament and plate transformers.
- Jones barrier strip for convenient connections.
- Includes a mounted switch which can be used for AC "on-off" or "transmit-receive" switch.
- Cabinet matches AF-67 Trans-citer.
- Primary circuit fused.
- Separate rectifier and filter circuits for each DC output.
- Both DC supplies use choke input filters.
- Uses 1 - 5U4G and 1 - 6X5GT tube.
- 24 volt tap on filament transformer for control or bias supply.
- Size, 11¼″ wide, 7″ high, 8½″ deep. Weight, 26 lbs.

ACCESSORIES

CFS-1 Cable	Complete cable, plug, and fanning strip to connect the PS-2V to the AF-67 Trans-citer.
PTR-1 Kit.	Includes rectifier, relay and filter condenser to allow "Push-to-talk" operation of your station from an AC supply.

MULTI - PRODUCTS COMPANY ● **OAK PARK 37, MICHIGAN**

OPERATING INSTRUCTIONS

OUTPUT—The PS-2V power supply has both 6V and 12V AC filament supplies. The 6V output has a rating of 6 amps. and the 12V supply has a rating of 3 amps. max. Both 6V and 12V supplies may be used simultaneously provided the sum of both currents do not exceed 6 amperes. There is also a 24 volt winding on the filament transformer rated at .1 amp. that can be used for control purposes or can be rectified and used as a bias supply. Approximately 36 volts DC can be had in this way.

In addition to the filament supplies, two H.V. supplies are included; one rated at 230 volts @ 80 ma., and one at 475 volts @ 170 ma. Both of these DC outputs can be used simultaneously. Each of these DC outputs has a separate rectifier, choke input filter, and bleeder resistor insuring good regulation.

CONNECTIONS—The primary power connection is brought out with a standard cord and plug. All other connections are made to a Jones type barrier terminal strip for ease of connecting wires and flexibility. Terminals "C", "115", "F", and "P" are all part of the primary circuit and are so arranged as to allow various combinations of switching arrangements. Terminals "C" and "115" are HOT at all times. By connecting a switch between terminals "115" and "F" the primary of the filament transformer can be turned "on" and "off". (This function is accomplished by the power "on-off" switch on the AF-67 Trans-citer when using the CFS-1 accessory cable). Connecting a switch between terminals "F" and "P" the plate transformer can be turned "on" and "off". (transmit-receive switch) The switch mounted on the front of the PS-2V power supply can be used for this purpose. The relay of the PTR-1 kit can be used for the "transmit-receive" switch if "push-to-talk" operation is desired.

The switch mounted on the PS-2V power supply is NOT connected to anything as delivered, but is supplied with leads that can be soldered by the customer to any terminal on the strip, depending on function desired.

Additional relays, such as antenna or receiver muting relays, can be connected across terminals "C" and "P", controlling the entire station from the PS-2V power supply.

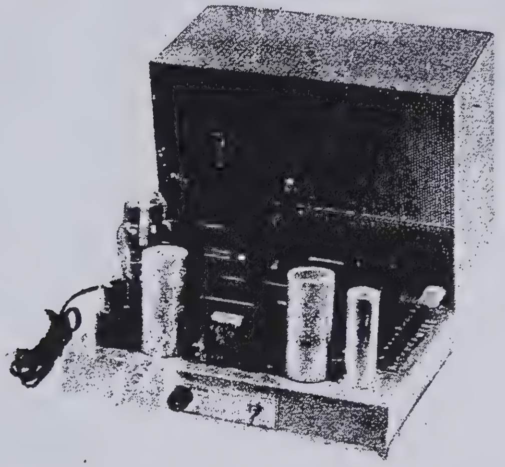
WARNING — ALWAYS REMOVE THE CORD AND PLUG FROM THE AC OUTLET WHEN MAKING CONNECTIONS TO THE TERMINAL STRIP OR WORKING ON THIS POWER SUPPLY. TERMINALS "C" AND "115" ARE ALWAYS HOT REGARDLESS OF SWITCH POSITIONS. VOLTAGES EMPLOYED IN THIS POWER SUPPLY CAN BE FATAL.

CFS-1 Cable—This cable makes all proper connections between the PS-2V power supply and the AF-67 Trans-citer. This cable permits the power "on-off" switch on the AF-67 to control the primary power to the PS-2V power supply. This cable also allows the push-to-talk switch on the microphone to control the transmit-receive function if the PS-2V is equipped with the PTR-1 kit below. The single wire extending from the 15 prong plug should be connected to the receiver "B" plus to supply the VFO in the AF-67 trans-citer for frequency spotting.

PTR-1 Kit—A kit consisting of a rectifier, relay, and filter condenser to allow the push-to-talk switch on the microphone to be used as a transmit-receive switch.

INSTALLATION—Mount the relay in the two holes provided in the chassis next to the filament transformer. Mount it in such a way that the contact terminals are towards the Jones terminal strip. Wire the "normally open" (relay de-energized) to terminals "F" and "P". Connect one relay coil terminal to the Jones terminal "X". Connect the rectifier G1 between remaining relay coil terminal and the 24 volt tap on the filament transformer. Connect this rectifier exactly as shown on the schematic diagram. Connect the 50 mfd. 50 volt electrolytic condenser from chassis to the junction of the relay coil and the rectifier, observe polarity. The relay should operate when terminal "X" is shorted to the chassis.

MULTI-ELMAC POWER SUPPLY



MODEL
PS-2V

115 VOLT
60 CYCLE

A UNIVERSAL POWER SUPPLY

Designed to be used with the MULTI-ELMAC AF-67 Trans-citer or a variety of other applications.

SPECIFICATIONS

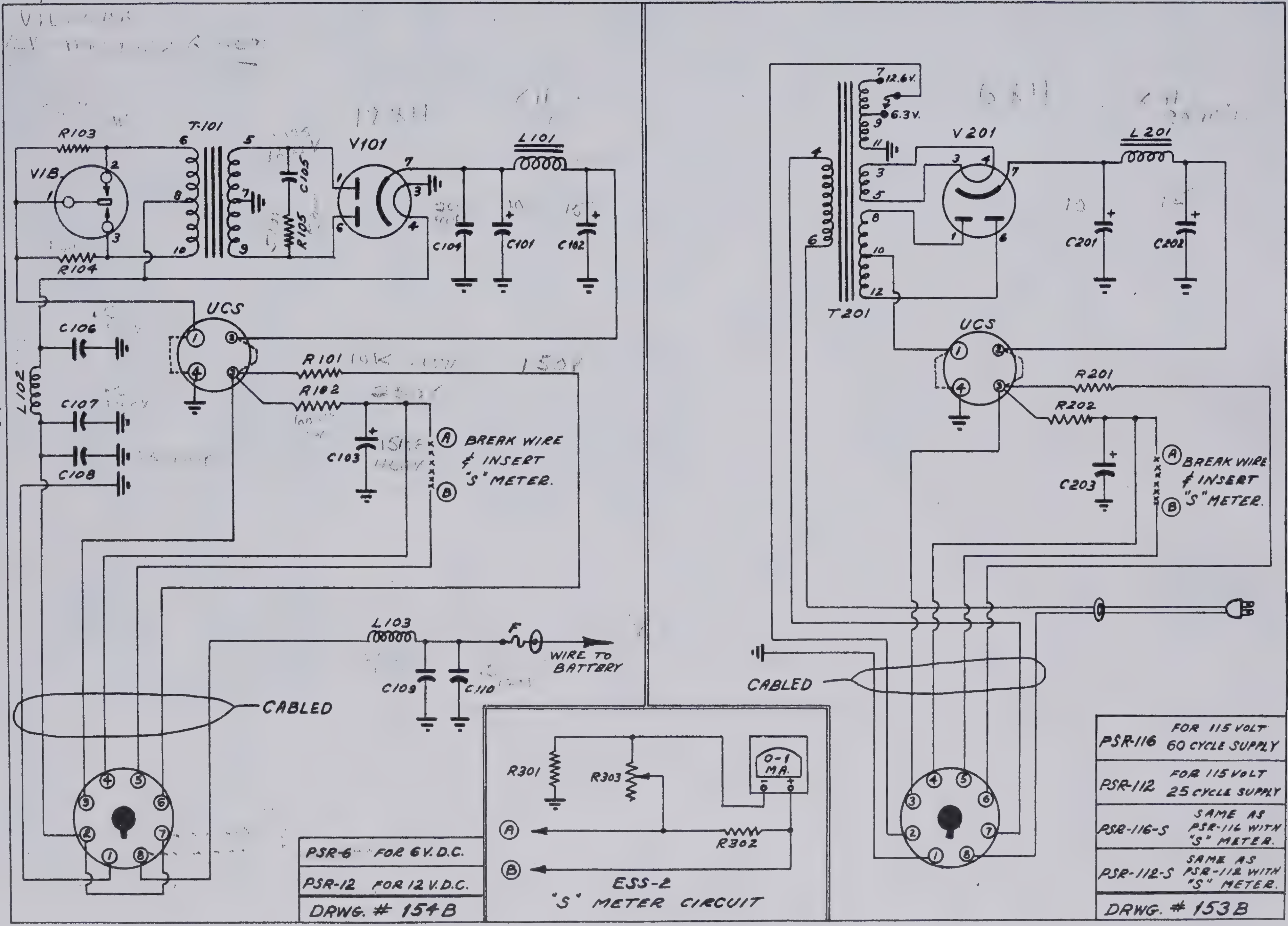
- 6V. @ 6A. or 12V. @ 3A. AC for filaments.
- 230 volts @ 80 ma. DC output.
- 475 volts @ 170 ma. DC output.
- Separate filament and plate transformers.
- Jones barrier strip for convenient connections.
- Includes a mounted switch which can be used for AC "on-off" or "transmit-receive" switch.
- Cabinet matches AF-67 Trans-citer.
- Primary circuit fused.
- Separate rectifier and filter circuits for each DC output.
- Both DC supplies use choke input filters.
- Uses 1 - 5U4G and 1 - 6X5GT tube.
- 24 volt tap on filament transformer for control or bias supply.
- Size, 11¼" wide, 7" high, 8½" deep. Weight, 26 lbs.

ACCESSORIES

CFS-1 Cable	Complete cable, plug, and fanning strip to connect the PS-2V to the AF-67 Trans-citer.
PTR-1 Kit.	Includes rectifier, relay and filter condenser to allow "Push-to-talk" operation of your station from an AC supply.

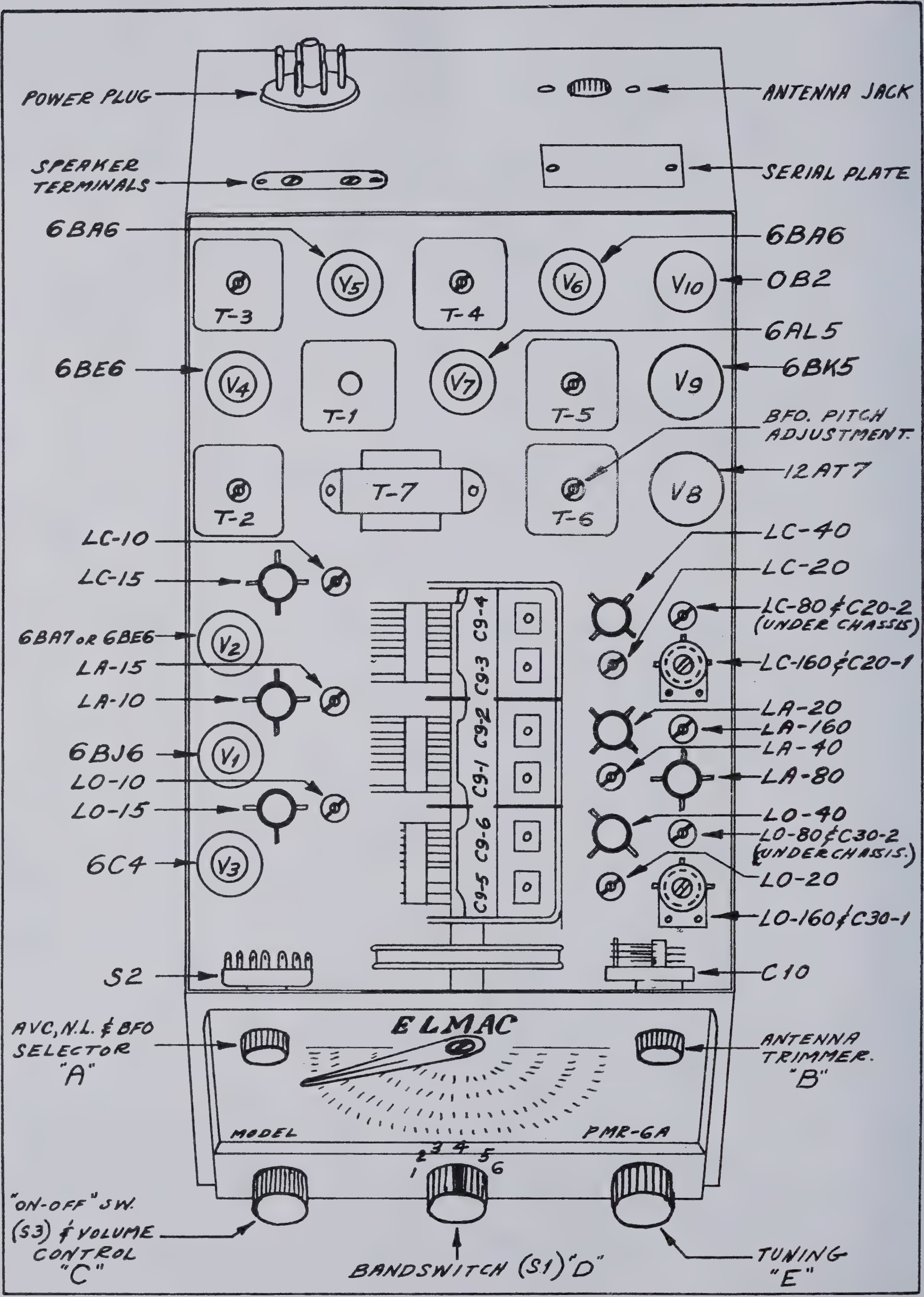
MULTI - PRODUCTS COMPANY ● **OAK PARK 37, MICHIGAN**

M-118



PSR-6	FOR 6 V.D.C.
PSR-12	FOR 12 V.D.C.
DRWG. # 154B	

PSR-116	FOR 115 VOLT 60 CYCLE SUPPLY
PSR-112	FOR 115 VOLT 25 CYCLE SUPPLY
PSR-116-S	SAME AS PSR-116 WITH "S" METER.
PSR-112-S	SAME AS PSR-112 WITH "S" METER.
DRWG. # 153B	

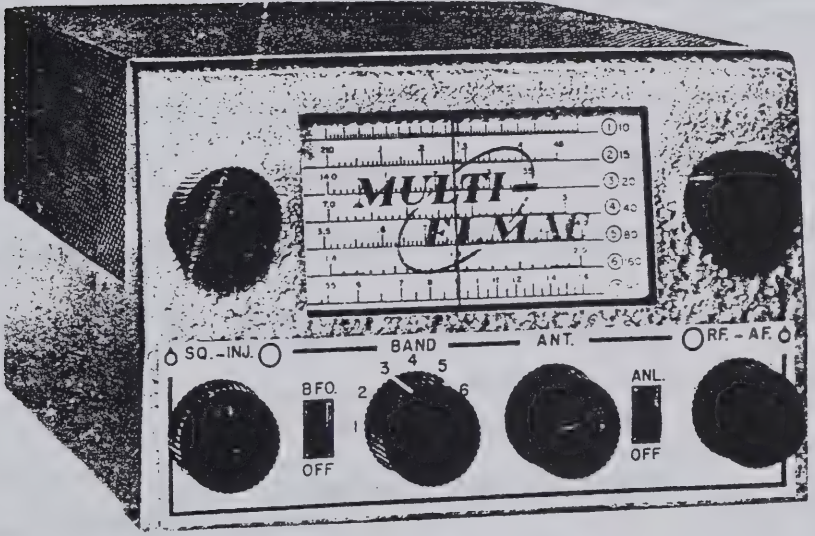

POWER PLUG
ANTENNA JACK
SPEAKER TERMINALS
SERIAL PLATE
6BA6
V5
T-3
T-4
6BA6
V6
V10
OB2
6AL5
6BE6
V4
T-1
V7
T-5
V9
6BK5
BFO. PITCH ADJUSTMENT.
T-2
T-7
T-6
V8
12AT7
LC-10
LC-40
LC-15
LC-20
LC-80 & C20-2 (UNDER CHASSIS)
6BA7 OR 6BE6
V2
C9-4
C9-3
C9-2
C9-1
C9-6
C9-5
LA-15
LC-160 & C20-1
LA-10
LA-20
LA-160
6BJ6
V1
LA-40
LA-80
LO-10
LO-15
LO-40
LO-80 & C30-2 (UNDER CHASSIS.)
6C4
V3
LO-20
LO-160 & C30-1
S2
C10
ELMAC
AVC, N.L. & BFO SELECTOR "A"
ANTENNA TRIMMER. "B"
MODEL
PMR-6A
1
2
3
4
5
6
"ON-OFF" SW. (S3) & VOLUME CONTROL "C"
BANDSWITCH (S1) "D"
TUNING "E"

DRWG. # 163

MULTI-ELMAC

Amateur Receiver

MODEL PMR 7
& ACCESSORIES



INSTALLATION
AND
OPERATING INSTRUCTION
MANUAL

MULTI-PRODUCTS CO. **OAK PARK, MICH.**

*Manufacturers of "**MULTI-ELMAC**" Products*

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MULTI-PRODUCTS COMPANY

Manufacturer of

MULTI-ELMAC

RADIO COMMUNICATIONS

AND CONTROL EQUIPMENT

21470 COOLIDGE HIGHWAY **OAK PARK 37, MICH.**

FORM NO. M-121

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SECTION 1

Description

1.1 GENERAL. The MULTI-ELMAC PMR-7 RADIO RECEIVER is a ten tube double conversion superheterodyne covering the 160, 80, 40, 20, 15, and 10 meter amateur bands, plus the standard broadcast band. Designed primarily as an efficient communications receiver for mobile use, it is also especially suitable, because of its small size, for (1) marine and aircraft installations; (2) portable operation; and (3) as a fixed station or monitoring receiver. It is not intended as a converter or accessory to another unit, but a complete receiver, employing a separate power supply and speaker as described in this manual. Every effort has been made to furnish the user with an extremely stable receiver of rugged construction, compact layout, and high sensitivity.

1.2 DIMENSIONS. The maximum external dimensions of the PMR-7 receiver, including the control knobs are: height, 4⅝″, width, 7″, and depth, 11½″. The depth behind the panel is 9⅞″. The net weight of the receiver is 8½ pounds.

1.3 CIRCUIT DESCRIPTION. The circuit consists of one stage of radio frequency amplification, a first mixer and stabilized local oscillator. The output frequency of the first mixer is 2238 kc. and there is one stage of amplification at this frequency. The second mixer and crystal controlled oscillator are combined into a single dual purpose tube. The output frequency of the second mixer is 262 kc. and there is one stage of amplification at this frequency. The detector, delayed A.V.C. and A.N.L. are combined into a single triple diode tube. The first audio amplifier and squelch control are combined into a dual purpose tube. The audio output is a beam power amplifier supplying sufficient audio output for speaker and headphone operation. The layout diagram of the receiver may be seen in figure 1.

High sensitivity and a good noise figure has been obtained by the use of a high gain R.F. amplifier and special R.F. coil design. The good noise figure is obtainable by designing the front end coils for optimum Q and minimum noise transfer. Since the primary noise characteristics of a receiver are determined in the R.F. coils, care in their design has resulted in an excellent signal to noise ratio and noise figure. A secondary consideration in determining the noise figure of a receiver is the selection of the last I.F. frequency. The noise passed by an I.F. amplifier is proportional to the bandpass of the amplifier. 262 kc. was chosen for good selectivity characteristics and pursuant noise reduction. The selectivity characteristics for the PMR-7 may be seen in figure 2.

The overall drift in the receiver has been kept to a minimum by the use of temperature compensating capacitors in the local oscillator and a crystal controlled second converter. Rigid mechanical construction also adds to the general stability of the unit.

The squelch circuit incorporated in the PMR-7 enables the receiver to be automatically silenced when no signal is being received. The squelch tube functions to cut off the audio amplifier when no A.V.C. voltage is developed. The threshold for the squelch can be controlled from the front panel for varying conditions of noise. If the control is adjusted just above the threshold, that is to just squelch the receiver, an increase in signal of .5 microvolt will open the squelch circuit.

Delayed A.V.C. is used in this receiver to provide maximum sensitivity with the use of A.V.C.. In ordinary Automatic Volume Control circuits, inherent noise in the receiver will produce some bias voltage. This bias voltage when applied to the amplifiers will reduce the sensitivity of a receiver. A system employing delayed A.V.C. prevents this bias from being applied to the amplifiers until the input signal is in excess of 8 volts at the A.V.C. rectifier diode.

The B.F.O. in the receiver injects 262 kc. energy into the output I.F. amplifier through an isolation amplifier. Both the pitch and the amount of injection are adjustable from the front panel. The purpose of the isolation amplifier is to prevent the B.F.O. from locking in with the signal present at the I.F. amplifier and to allow variation of the injection voltage without varying the B.F.O. frequency. Variable pitch and injection are a "must" when receiving C.W. and S.S.B. signals.

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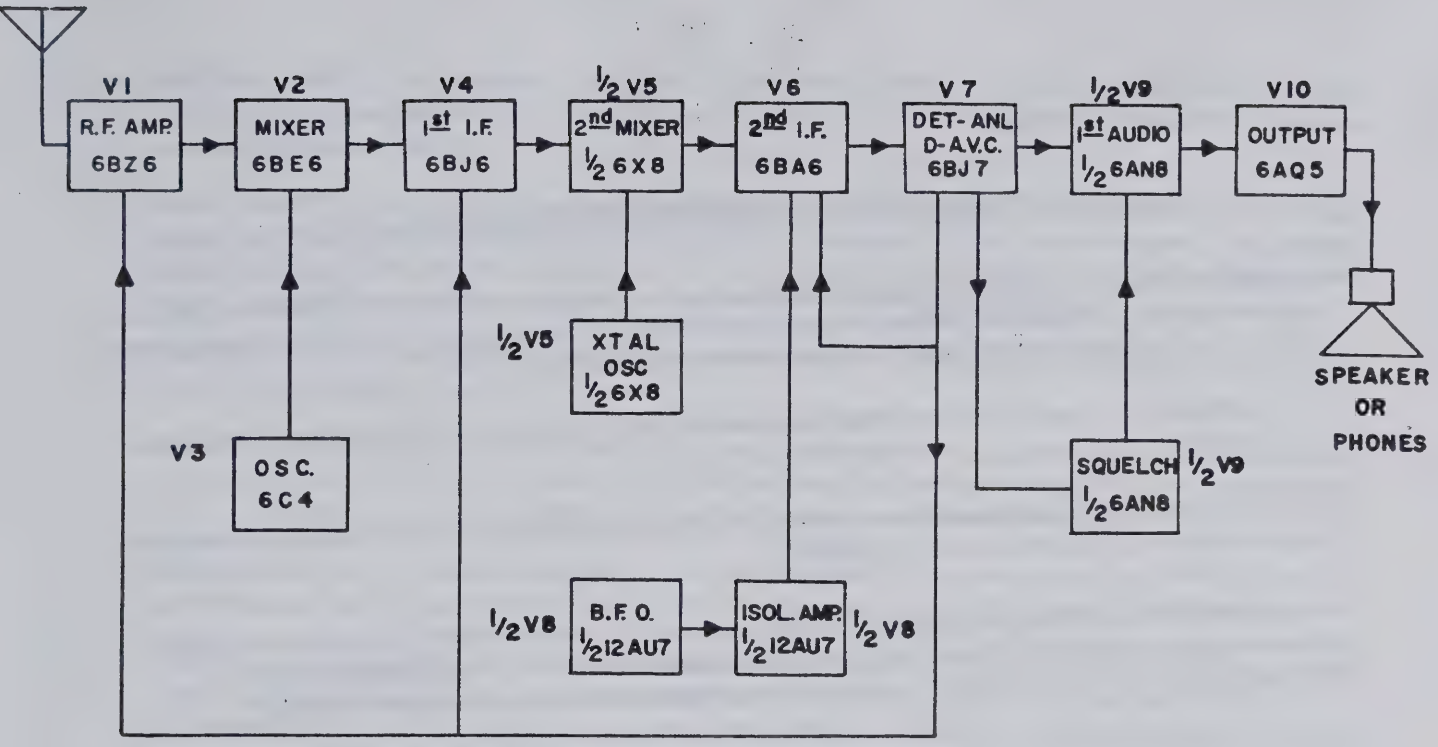

PMR-7 BLOCK DIAGRAM FIGURE 1

1.4 TUBE COMPLEMENT. The PMR-7 is supplied complete with all tubes tested in the receiver at the time of alignment. The tube types are as follows:

R.F. Amplifier	6BZ6
First Mixer	6BE6
H. F. Oscillator	6C4
First I.F. Amplifier	6BJ6
Second Mixer	6X8
Second I.F. Amplifier	6BA6
Det., A.V.C., A.N.L.	6BJ7
First Audio and Squelch	6AN8
B.F.O. and Amplifier	12AU7
Audio Output	6AQ5

1.5 TUNING SYSTEM. A three-gang tuning capacitor and 21 high-Q coils are used to cover the 7 separate bands selected by a panel switch, as follows:

Band 1	10 meters	28.0 to 29.7 Mc
Band 2	15 meters	21.0 to 21.45 Mc
Band 3	20 meters	14.0 to 14.40 Mc
Band 4	40 meters	7.0 to 7.30 Mc
Band 5	80 meters	3.5 to 4.0 Mc
Band 6	160 meters	1.8 to 2.0 Mc
Band 7	Broadcast band	.54 to 1.6 Mc

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1.6 ANTENNA INPUT. The receiver is designed for use with a resonant antenna coupled to the receiver input with a transmission line of 50 to 72 ohms impedance. Detailed installation recommendations are contained in paragraph 2.3.

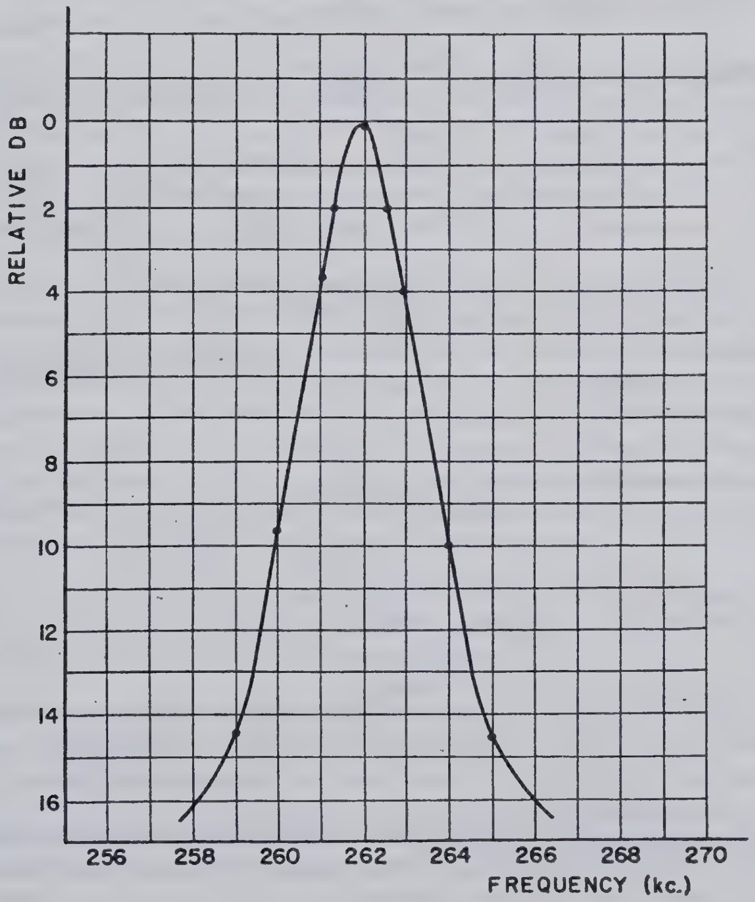
1.7 AUDIO OUTPUT. An output transformer matching the output tube to a permanent magnet dynamic speaker having a voice coil impedance of 3 to 6 ohms is included on the receiver chassis. The speaker leads terminate at the accessory plug on the A.C. power supply. Also included on the rear of the receiver chassis is a headphone jack that disables the speaker when the headphones are in use.

1.8 POWER SUPPLIES AND ACCESSORIES. The following power supplies are available for use with the MULTI-ELMAC PMR-7 receiver.

The PSR-117 Power supply, for 117 volts A.C. 50-60 cycle operation, supplies the necessary plate and filament voltages for the receiver and can be used to power the low level stages of a companion transmitter. The power supply has an "S" meter and adjusting potentiometer included.

The PSR-612 Power supply is for either 6 or 12 volt operation. It is the same as the PSR-117 without the "S" meter. Both 6 and 12 volt operation will be discussed in the section under installation.

The ESS-3 is a 2 inch "S" meter mounted in a metal box suitable for mobile operation. It is supplied with a cable and plug and may be used in conjunction with the accessory plug on the PSR-612.
The above power supplies contain an accessory plug that may be used to supply companion units or accessory kits for the receiver.



PMR-7 SELECTIVITY CURVE

FIGURE 2

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SECTION 2

Installation and Operation

2.1 **GENERAL CONSIDERATIONS.** No two installations being alike, the owner of a MULTI-ELMAC PMR-7 receiver will vary his installation according to the space available, and the individual operator's desires in regard to operating practices. Regardless of these variations, whenever the receiver is installed in a vehicle, there are three essentials to a proper installation; (1) Convenient location for operation, including ease of observation; (2) Rigid mechanical mounting, and (3) elimination of radio noise. The amateur experienced in mobile radio work will have his own preferences. It is suggested that before installation is begun, the owner read the very thorough treatment given to mobile installations in the past issues of QST and CQ magazines.

2.2 **MOUNTING METHODS.** The light weight of the PMR-7 makes it readily adaptable to a hanging mount from the lower edge of the dashboard. A length of aluminum angle stock from the rear corner of the receiver cabinet to the fire wall of the vehicle will complete a simple but rigid mount. If the individual wishes to spend the extra time and money and the car dashboard has sufficient space, a very neat installation can be effected by making the proper cut-out into the instrument panel and mounting the receiver flush. This method is suitable where the panel contains a removable metal grille which can be replaced if the receiver is removed. Due to the great number of variations encountered in mounting methods no brackets are included. Most amateurs have enough surplus angles to fashion a bracket that would serve their particular needs better than any universal bracket that could be supplied.

2.3 **ANTENNA.** The MULTI-ELMAC PMR-7 receiver will perform most efficiently when it is coupled to an antenna resonant on the frequency band to which the receiver is tuned. As in the operation of a fixed amateur station, this condition is most easily obtained by using the same antenna for both transmitting and receiving. A change-over relay operated by the push-to-talk switch on the microphone is required, and may be installed between the receiver and transmitter with a common coaxial line to the antenna. See Figure 6 for a typical circuit.

2.4 **POWER SUPPLY.** The MULTI-ELMAC PMR-7 receiver requires a filament voltage of 6.3 or 12.6 volts at 3.6 or 1.8 amperes respectively, and a "B" supply voltage of 250 volts at 60 Ma. and 105 volts regulated at 10 Ma. This latter voltage may be derived from the 250 volt supply. The power supply may be located anywhere in the vehicle providing the hot lead (either 6 or 12 volts) is heavy enough to furnish the necessary current without undue voltage drop. Make sure that the case of the power supply is efficiently grounded to the car body. If this cannot be done with the mounting bolts, a heavy copper braid ground strap must be provided. This insures sufficient voltage to the power supply and also eliminates the possibility of the receiver picking up vibrator hash noise. The power supply can be bolted to the fire wall either in the car or under the hood.

The D.C. power supply may be operated on either 6 or 12 volts by merely changing a plug that can be seen if the top cover of the power supply is removed. This plug changes the filaments in the receiver and makes the proper modifications in the power supply.

2.5 **"S" METER.** Provision has been made for the attachment of an external "S" meter giving relative signal strength readings. This meter is available in the form of a kit that can be mounted in any convenient place in the vehicle and connected to the accessory plug located on the power supply.

2.6 **CONTROL CIRCUITS.** While this manual does not include within its scope general instructions on control systems for mobile installations, it is important for the user of the PMR-7 receiver to employ control circuits that will (a) protect the receiver from R.F. overload by disabling it during periods of transmission, (b) make the transmitter instantly inoperative when the send-receive switch is released, and (c) achieve a maximum economy of battery drain. A small single-pole double-throw relay, when using a MULTI-ELMAC power supply, will mute the receiver instantly when the send-receive switch is operated. A typical system of this type may be seen in Figure 5.

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2.7 RECEIVER CONTROLS. The MULTI-ELMAC PMR-7 has eight controls and two switches on the front panel. Figure 4 shows the front view of the receiver and the control layout.

Control "A"—Concentric control.

1. Center, Squelch and A.V.C. on-off switch.
2. Outside, B.F.O. injection

Control "B"—Bandswitch.

Control "C"—Antenna trimmer. Peak for each band.

Control "D"—Concentric control.

1. Center, Audio gain and power on-off switch.
2. Outside, R.F. gain control.

Control "E"—Tuning knob.

Control "F"—B.F.O. Pitch control.

Switch "G" —A.N.L. on-off switch.

Switch "H" —B.F.O. on-off switch.

2.8 VEHICULAR NOISE SUPPRESSION. The proper utilization in a mobile installation of a good communications receiver such as the MULTI-ELMAC PMR-7 is possible only when vehicular noise has been effectively eliminated or suppressed. Many radio noises present in a vehicle can be eliminated at their source. Most other noises of local origin can be suppressed, using techniques well described in current literature. After efficient noise suppression has been employed, it will be found that the automatic noise limiter built into the MULTI-ELMAC PMR-7 receiver will reduce all but the worst noise pulses to a level which will not interfere with satisfactory radio communication. It is particularly recommended that the following noise suppression be accomplished.

(1) The installation of spark plugs containing built-in 10,000 ohm suppressors or 10,000 ohm suppressors mounted on each plug.

(2) The installation of a .1 mfd coaxial capacitor in series with the battery lead to the ignition coil. This should be mounted as close as possible to the coil input terminal, and a good ground made to the capacitor case.

(3) The installation of a .1 mfd coaxial capacitor in the "hot" lead coming out of the vehicle generator armature, replacing the normal automotive unit. The capacitor should be carefully grounded to the generator frame. All paint and dirt should be cleaned off with sandpaper.

(4) The installation of a .1 mfd coaxial capacitor between the battery terminal of the voltage regulator and ground, with the capacitor case well grounded as before. The installation of a .002 mfd mica capacitor in series with a four (4) ohm carbon resistor from the field terminal of the voltage regulator to ground.

(5) Residual noise remaining after the above precautions have been taken can be located by the process of elimination. In certain makes of automobiles, the various panel instruments radiate interference at radio frequencies which can be eliminated with appropriate by-pass capacitors from the "hot" side of the offending instrument to ground.

W4AFM

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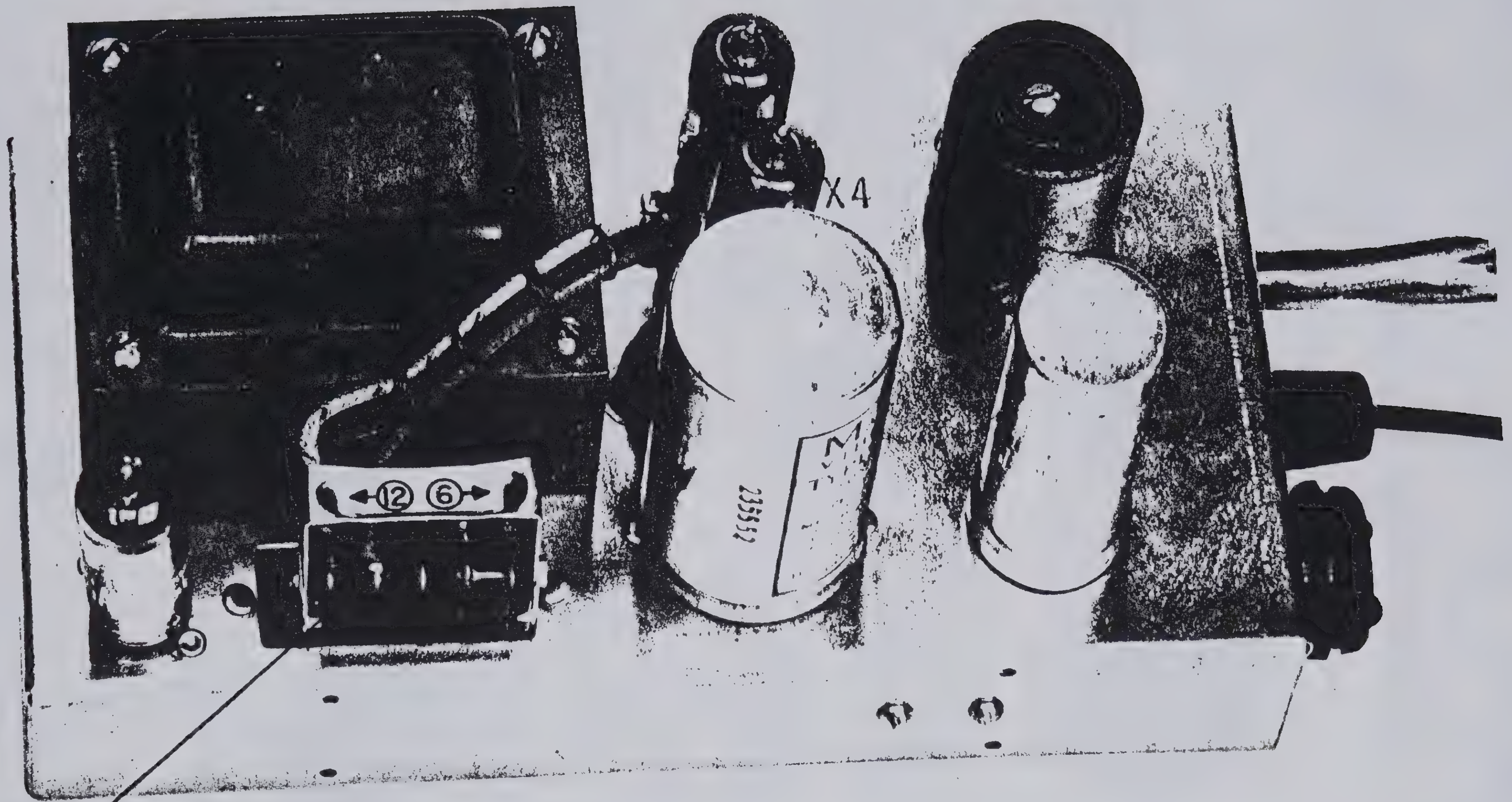

6VOLT-12VOLT CONVERSION PLUG. SHOWN IN 6 VOLT POSITION, MOVE TO LEFT FOR 12VOLT OPERATION.

FIG.3 PSR 612

W4AFM

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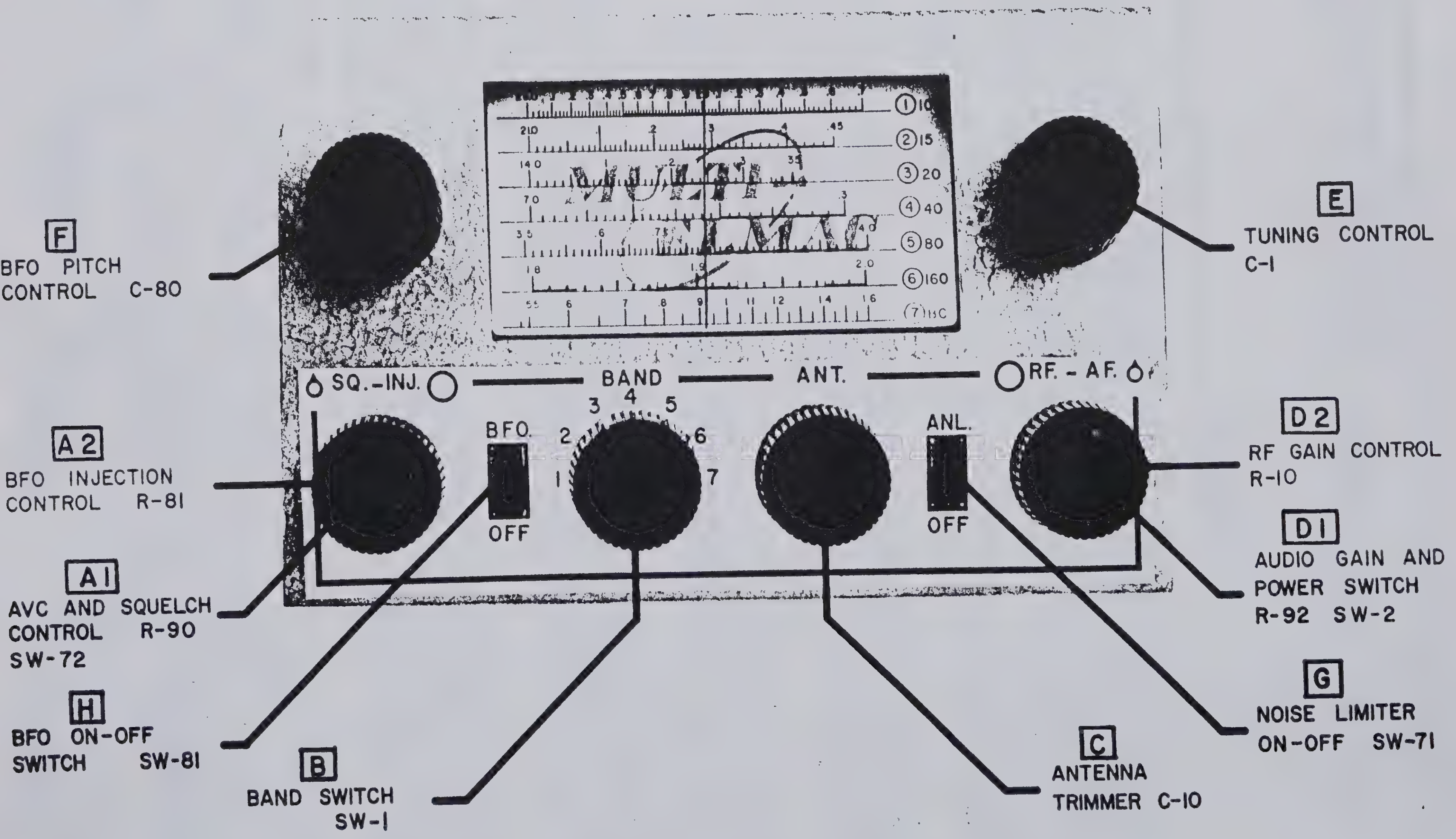

FIGURE 4. PMR-7 FRONT PANEL CONTROL LAYOUT

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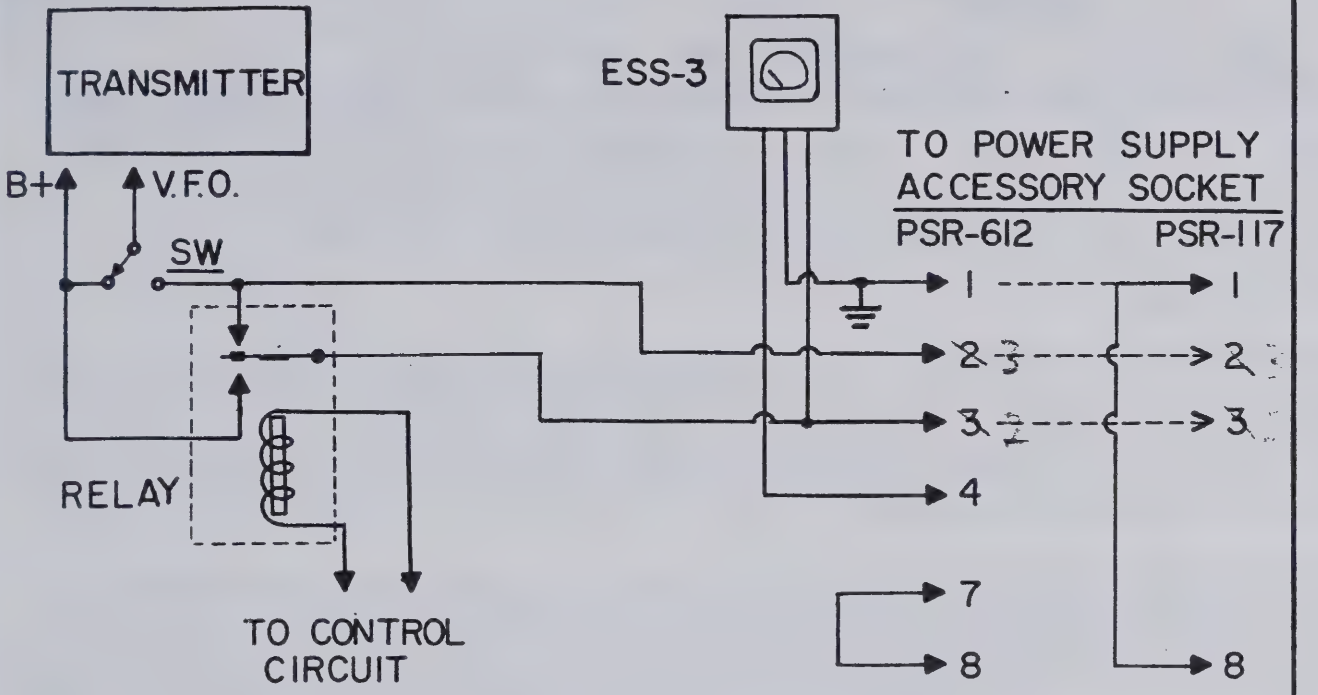
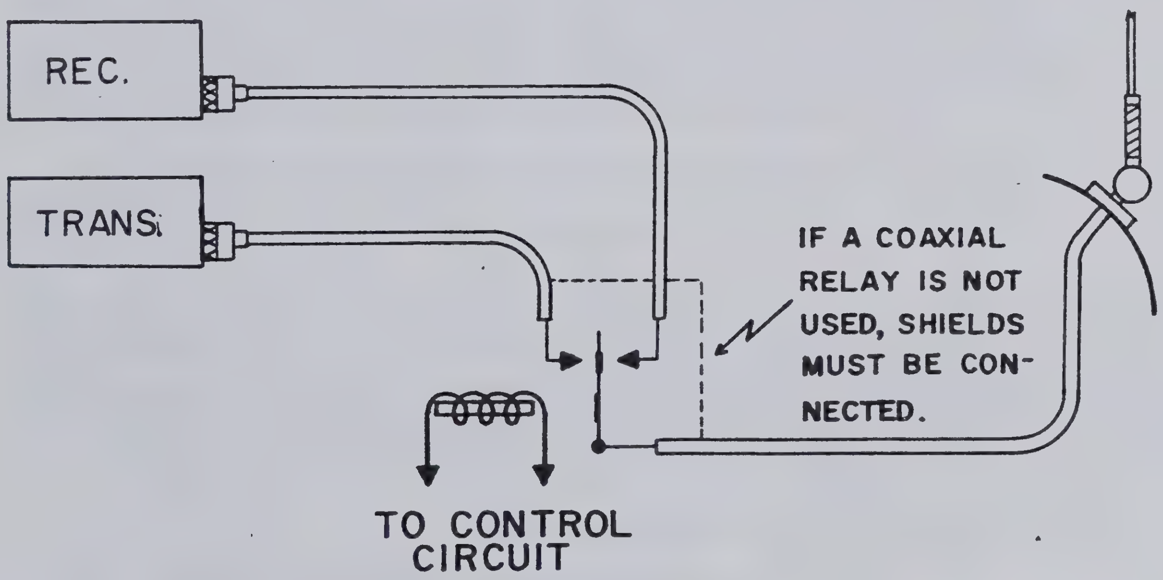


FIG. 5 ACCESSORY SOCKET WIRING



IF A COAXIAL RELAY IS NOT USED, SHIELDS MUST BE CONNECTED.

FIG. 6 ANTENNA CIRCUIT

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SECTION 3

Service and Alignment

3.1 **GENERAL.** Satisfactory operation of this receiver depends on several external factors. Before removing a receiver which is performing in an unsatisfactory manner, carefully inspect antenna connections, power cables and plugs, the storage battery and connections (if a vehicular installation), and the A.C. power source (if operated in a fixed location), and the speaker connections. It is an aggravating waste of time and effort to remove and attempt to service a receiver when the trouble is an external one.

(a) ANTENNA. If the receiver has its normal noise level, but signals are very weak, look for a broken antenna lead close to the receiver, or for an open or inoperative antenna relay.

(b) CABLES AND PLUGS. The initial installation should locate all cables and plugs where they will not be exposed to physical shock or subjected to twisting and bending.

(c) FUSES. Check fuses with an ohmmeter. A good fuse has no appreciable resistance.

3.2 **TUBES.** Even though modern methods of production are producing more reliable tubes than ever, the first source of trouble is most likely to be a defective tube. Tube failure will produce weak signals, intermittent operation, noise, or a completely dead receiver. When checking tubes, mark them as they are removed from the receiver so that they may be returned to their original sockets. Where a tube is changed in any circuit, that circuit should be re-aligned for peak performance as outlined in the section on alignment.

New tubes should be tapped while operating to check for microphonics, which will ruin operation of a mobile receiver.

3.3 **CIRCUIT FAILURE.** Excluding tubes, the most common source of circuit failure will invariably be found in the dozens of resistors and capacitors within the receiver. A defective resistor or capacitor can usually be found by a point-to-point continuity test, although a careful visual inspection will often show the defective part, such as charred resistors. The operating voltage shown on the circuit diagram permits a careful check of operating elements. The check should be made with a D.C. voltmeter of 20,000 ohms per volt sensitivity or a vacuum tube voltmeter. All measurements are taken with the antenna input shorted, switch "G" in the off position and the bandswitch in position "1". All measurements are made using a PSR-117 power supply. (Any supply may be used that will give the same "B" voltage.)

3.4 **GENERAL ALIGNMENT INSTRUCTIONS.** Thoroughly familiarize yourself with the layout of all of the coils as shown in Figures 7 and 8 before beginning alignment. All of the coils are in cans including the R.F. and I.F. coils with one exception. The broadcast oscillator coil is located under the chassis near the front of the receiver as can be seen in Figures 7 and 8.

Check the dial cord and the pointer to be certain that there is sufficient tension on the cord, and that the pointer rides free of all obstructions. Before alignment, be sure you have an accurate signal generator. If at all possible, crystals that fall near the alignment frequencies specified are preferred for maximum accuracy. The alignment of the receiver can never be more accurate than the signal generator with which it was aligned.

3.5 **I.F. AND B.F.O ALIGNMENT.** Remove the 6C4 oscillator tube.

Set the R.F. gain control (Control "C") in its full clockwise position.

Set the B.F.O. Switch (Switch "H") in the off position. Connect the signal generator through a .001 mfd. mica capacitor to the center section of the tuning capacitor.

Connect a vacuum tube voltmeter from the A.V.C. buss to ground. (If your receiver power supply is equipped with an "S" meter, the vacuum tube voltmeter is not necessary.) If an "S" meter is not included and you do not have a vacuum tube voltmeter available, connect a 0 to 10 milliampere

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meter in series with the lead coming from pin 6 on the receiver power plug. The MULTI-ELMAC PSR-117 is equipped with an "S" meter and on the MULTI-ELMAC PSR-612 the 0 to 10 milliampere meter may be connected to pin 3 and 4 of the accessory plug with the jumper removed.

With the signal generator set at 2238 kc. adjust all of the I.F. slugs for maximum response. (It should be noted that maximum response is a maximum reading on the "S" meter and a minimum reading on the 0 to 10 milliampere meter.) There are two slugs in T2, T4, and T6 adjustable from the top and bottom of the chassis. In T5, there is only one adjusting slug that can be either reached from the top or bottom of the chassis. A special 3/32 hex screwdriver is necessary for the adjustment of all coils. When adjusting the I.F. coils for maximum response, you should be careful to keep the output from the signal generator low enough to prevent overload of the receiver. When the I.F. stages have been aligned, turn on the B.F.O. (Switch "H"), turn up the injection control (Clockwise rotation of control A-2) and set the B.F.O. pitch control (Control "F") at mid range. Adjust the B.F.O. coil, T8, for zero beat. It will be noted that it is not necessary to adjust the 262 kc. amplifier with 262 kc. output from the signal generator. This is true because the crystal oscillator (2500 kc.) derives 262 kc. automatically from the 2238 kc. signal. (2500-2238 equals 262)

Replace the 6C4 tube.

3.6 **R. F. ALIGNMENT.** Before the R.F. alignment is begun the pointer must be positioned properly in respect to the dial. When the tuning capacitor is completely meshed (closed) the pointer should be aligned with the edge of the black border at the left side of the dial face. If this is not done the receiver may not track properly across the entire tuning range.

Any signal generator used to align this receiver must have a good attenuator. The output from the signal generator should be kept low enough to prevent the "S" meter from reading over S6.

The Bands may be aligned in any order, but for the sake of this manual, we will start with band 1 and align the bands in order.

BAND 1 (10 Meters—28.0 to 29.7 Mc.)

Set the Antenna trimmer in the middle of its range.

Set the Bandswitch on Band 1.

Set the receiver Dial to 29.0 Mc.

Connect a signal generator to the receiver antenna jack and set the generator to 29.0 Mc.

Adjust the 10 Meter oscillator coil until the signal is tuned in properly.

Adjust the 10 Meter Antenna coil and Converter coil for maximum output.

Check the tracking at 28.0 and 29.7 Mc. If the tracking is seriously off at these two points the setting of trimmer C30-10 will have to be changed and the oscillator coil readjusted. Several trials between trimmer setting and coil adjustment may be necessary to achieve proper tracking. NOTE. Oscillator is on the low side of the signal. It will be impossible to make this band track if the oscillator is on the high side.

BAND 2 (15 Meters—21.0 to 21.45 Mc.)

Set the Antenna trimmer in the middle of its range.

Set the Bandswitch on Band 2.

Set the receiver Dial and the signal generator to 21.3 Mc.

Adjust 15 Meter oscillator coil until the signal is tuned in properly.

Adjust the 15 Meter Antenna and Converter coils for maximum output.

Check the tracking at 21.0 and 21.45 Mc. If the tracking is off proceed as for 10 meters above using C30-15 and the 15 meter oscillator adjustment slug. NOTE. Oscillator is on the low side of the signal.

BAND 3 (20 Meters—14.0 to 14.4 Mc.)

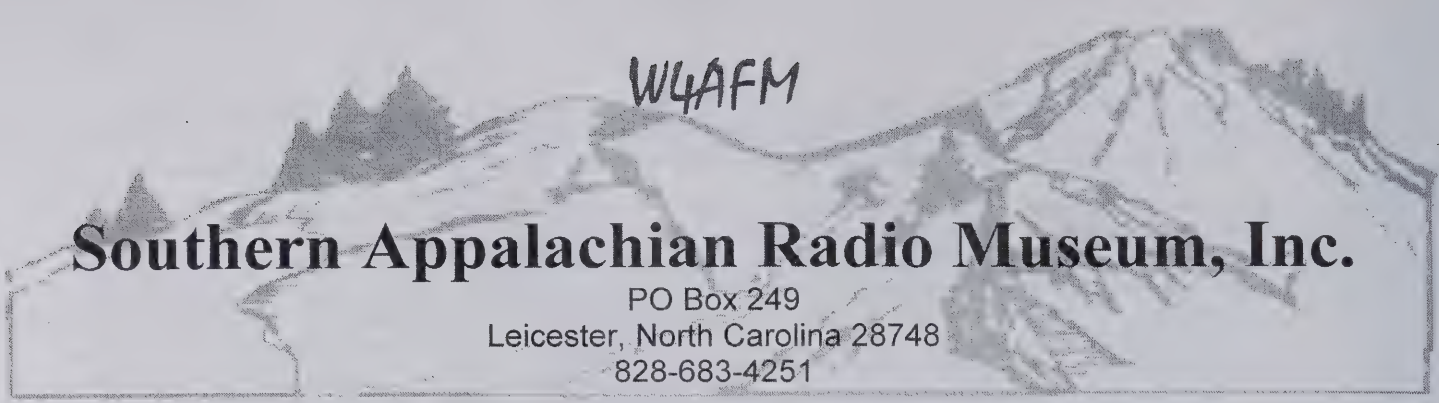
Set the Antenna trimmer in the middle of its range.

Set the Bandswitch on Band 3.

Set the receiver Dial and the signal generator to 14.2 Mc.

Adjust the 20 Meter oscillator coil until the signal is tuned in properly.

W4AFM



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Adjust the 20 Meter Antenna and Converter coils for maximum output.

Check the tracking at 14.0 and 14.4 Mc. Correct any error in tracking using trimmer C30-20 and the meter oscillator coil adjustment slug. NOTE. The oscillator is on the high side of the signal.

BAND 4 (40 Meters—7.0 to 7.3 Mc.)

Set the Antenna trimmer in the middle of its range.

Set the Bandswitch on Band 4.

Set the receiver Dial and the signal generator to 7.15 Mc.

Adjust the 40 Meter oscillator coil until the signal is tuned in properly.

Adjust the 40 Meter Antenna and Convertor coils for maximum output.

Check the tracking at 7.0 and 7.3 Mc. Correct any error in tracking by using trimmer C30-40 and the 40 meter oscillator coil adjustment slug. Note. The oscillator is on the high side of the signal.

BAND 5 (80 Meters—3.5 to 4.0 Mc.)

Set the Antenna trimmer to where the plates are about one quarter meshed. The antenna coil will not track at any other setting.

Set the Bandswitch on Band 5.

Set the receiver Dial and the signal generator to 3.75 Mc.

Adjust the 80 Meter oscillator coil until the signal is tuned in properly.

Adjust the 80 Meter Antenna and Converter coils for maximum output.

Check the tracking at 3.5 and 4.0 Mc. Correct any error in tracking by using trimmer C30-80 and the 80 meter oscillator coil adjustment slug. NOTE. The oscillator is on the high side of the signal.

BAND 6 (160 Meters—1.8 to 2.0 Mc.)

Set the Antenna trimmer to where the plates are about one quarter meshed.

Set the Bandswitch on Band 6.

Set the receiver Dial and the signal generator to 1.9 Mc.

Adjust the 160 Meter oscillator coil until the signal is tuned in properly.

Adjust the 160 Meter Antenna and Converter coils for maximum output.

Check the tracking at 1.8 and 2.0 Mc. Correct any error in tracking by using trimmer C30-160 and the 160 meter oscillator adjustment slug. NOTE. The oscillator is on the high side of the signal.

BAND 7 (Broadcast .54 to 1.6 Mc.)

Set the Antenna trimmer to where the plates are about one quarter meshed.

Set the Bandswitch on Band 7.

Set the receiver Dial and the signal generator to 1.0 Mc.

Adjust the broadcast oscillator coil until the signal is tuned in properly.

Adjust the broadcast Antenna and Converter coils for maximum output.

Check the tracking at 600 and 1500 Kc. Correct any error in tracking by using trimmer C37 and the broadcast oscillator coil slug.

Set receiver dial and signal generator to 600 Kc. Peak the Broadcast Converter coil at this setting for maximum output.

Set the receiver Dial and signal generator to 1500 Kc. and adjust trimmer C22 for maximum output at this frequency. NOTE. The oscillator is on the high side of the signal on this band and the oscillator frequency is relatively high due to the high first intermediate frequency. The broadcast oscillator tunes from 2.778 to 3.838 Mc.

3.7 "S" METER ADJUSTMENT. Remove antenna and short input jack with a piece of bare wire. Adjust potentiometer R-200 until the "S" meter reads zero under this zero signal condition. The "S" meter should read zero when the receiver is turned off. If not, adjust to zero with panel screw adjustment on the meter. If it becomes necessary to replace the second I.F. amplifier tube, a careful selection of tubes must be made since changes in the electrical characteristics of the tube will change the sensitivity of the "S" meter.

W4AFM

Southern Appalachian Radio Museum, Inc.

PO Box 249
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828-683-4251

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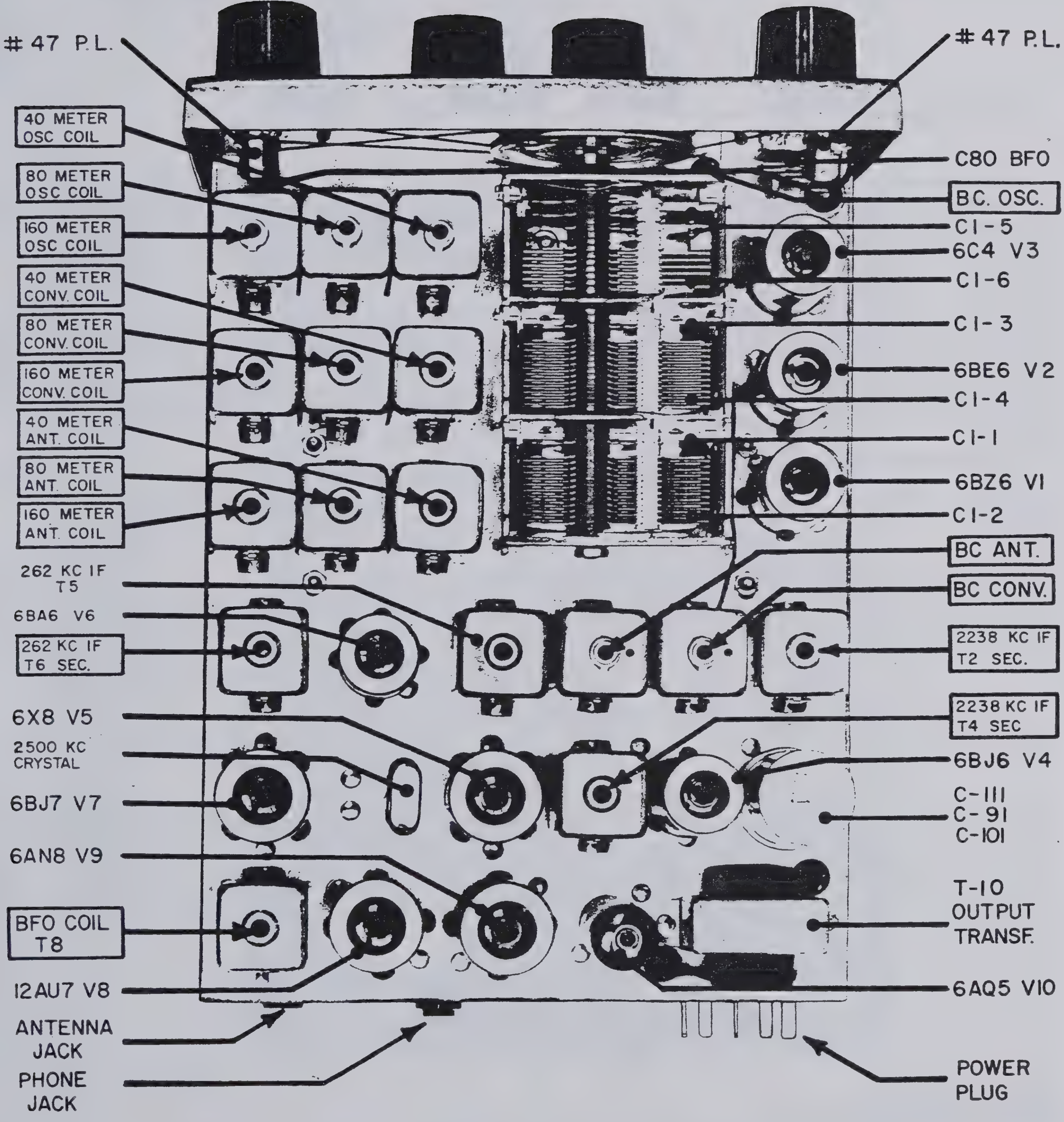
President, The Southern Appalachian Radio Museum, Inc.

Web Site: www.Saradiomuseum.org



# 47 P.L.
40 METER OSC COIL
80 METER OSC COIL
160 METER OSC COIL
40 METER CONV. COIL
80 METER CONV. COIL
160 METER CONV. COIL
40 METER ANT. COIL
80 METER ANT. COIL
160 METER ANT. COIL
262 KC IF T5
6BA6 V6
262 KC IF T6 SEC.
6X8 V5
2500 KC CRYSTAL
6BJ7 V7
6AN8 V9
BFO COIL T8
12AU7 V8
ANTENNA JACK
PHONE JACK
# 47 P.L.
C80 BFO
BC. OSC.
C1-5
6C4 V3
C1-6
C1-3
6BE6 V2
C1-4
C1-1
6BZ6 V1
C1-2
BC ANT.
BC CONV.
2238 KC IF T2 SEC.
2238 KC IF T4 SEC
6BJ6 V4
C-111
C-91
C-101
T-10 OUTPUT TRANSF.
6AQ5 V10
POWER PLUG

FIGURE - 7.

W4AFM

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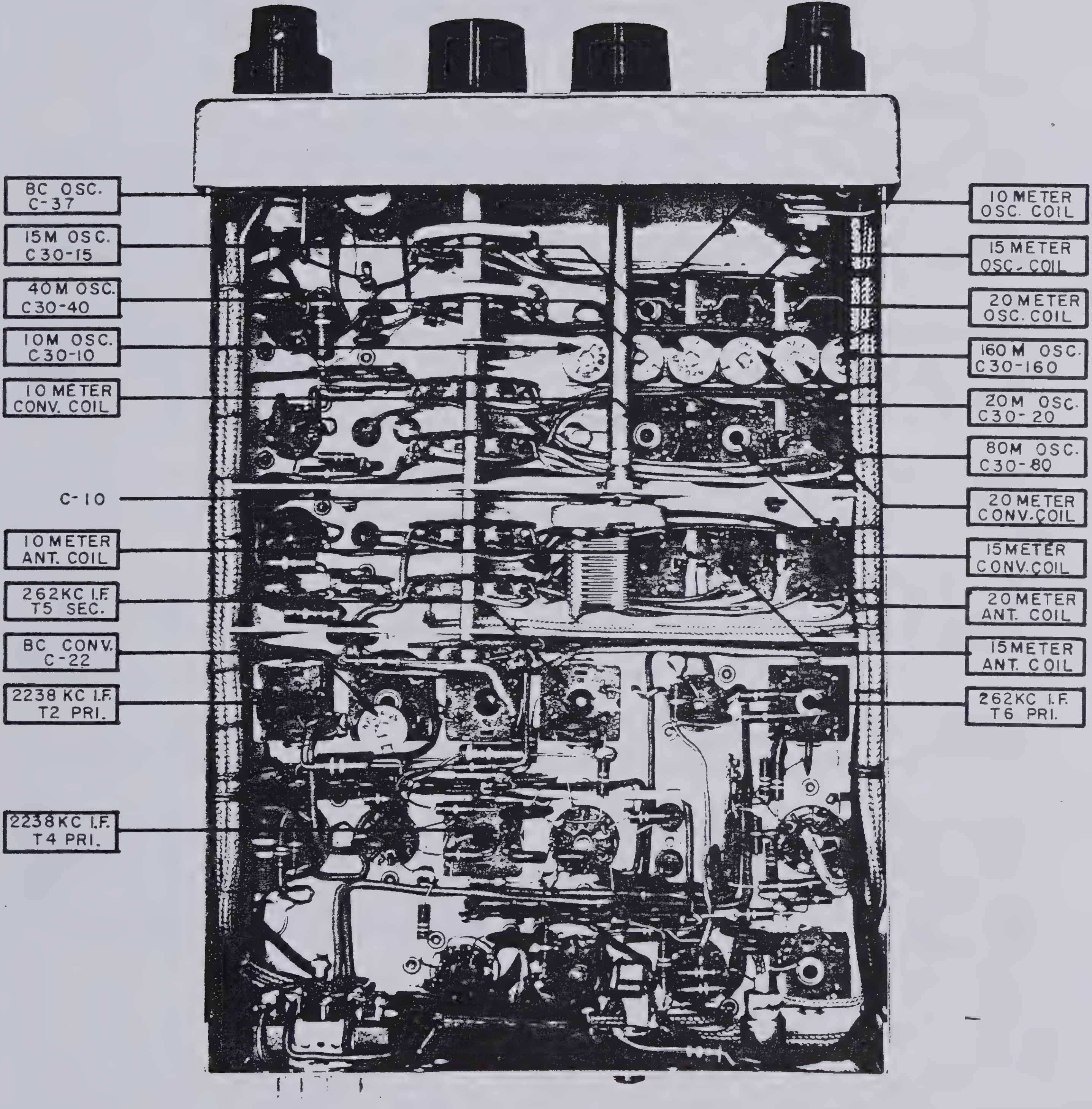
BC OSC. C-37
15M OSC. C30-15
40M OSC. C30-40
10M OSC. C30-10
10 METER CONV. COIL
C-10
10 METER ANT. COIL
262KC I.F. T5 SEC.
BC CONV. C-22
2238 KC I.F. T2 PRI.
2238KC I.F. T4 PRI.
10 METER OSC. COIL
15 METER OSC. COIL
20 METER OSC. COIL
160 M OSC. C30-160
20M OSC. C30-20
80M OSC. C30-80
20 METER CONV. COIL
15 METER CONV. COIL
20 METER ANT. COIL
15 METER ANT. COIL
262KC I.F. T6 PRI.

FIGURE-8.

W4AFM

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SECTION 4

Appendix

4.1 WARRANTY. This receiver has been carefully tested and was shipped from the factory in perfect operating condition. If the set arrives damaged in transit, it is important that you file claim immediately against the carrier.

THE MULTI-PRODUCTS COMPANY warranting this receiver to be free from defective materials and workmanship, agrees to repair or replace, without charge, any defective part or accessory provided notice of the claimed defect is given the manufacturer within 90 (ninety) days of the date of sale to the original purchaser. Any part returned to the manufacturer shall be shipped prepaid by the owner. Any failure of the equipment following modification by the user, or occurring through application of power supply voltages other than those specified in this instruction manual shall not constitute a defect within this warranty.

This warranty shall not become effective until the Owner's Registration Card supplied with the equipment has been filled out and mailed to the manufacturer. Please fill out and mail this card promptly.

The manufacturer reserves the right to make any changes in the receiver without obligating itself with respect to prior production.

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PMR-7 Parts List

4.2

C1-1-2-3-4-5-6	Tuning Capacitor Part #326
C10	Antenna Trimmer 75 MMF Part #325-1
C11	.005 MFD Dual Disc Ceramic (Part of C16)
C12	.005 MFD Disc Ceramic
C15	.005 MFD Disc Ceramic
C16	.005 MFD Dual Disc Ceramic (Part of C11)
C17	.005 MFD Disc Ceramic
C21	.005 MFD Dual Disc Ceramic (Part of C25)
C22	5 to 25 MMF Trimmer
C25	5 MMF Silver Mica
C26	.005 MFD Dual Disc Ceramic (Part of C21)
C27	.005 MFD Dual Disc Ceramic (Part of C45)
C30-10	5 to 25 MMF Trimmer
C30-15	5 to 25 MMF Trimmer
C30-20	5 to 25 MMF Trimmer
C30-40	5 to 25 MMF Trimmer
C30-80	5 to 25 MMF Trimmer
C30-160	5 to 25 MMF Trimmer
C35	75 MMF Silver Mica
C36	200 MMF Silver Mica
C37	5 to 25 MMF Trimmer
C38	56 MMF NPO Tubular Ceramic
C39	.01 MFD Disc Ceramic
C41	.005 MFD Dual Disc Ceramic (Part of C46)
C45	.005 MFD Dual Disc Ceramic (Part of C27)
C46	.005 MFD Dual Disc Ceramic (Part of C41)
C47	.005 MFD Dual Disc Ceramic (Part of C56)
C55	75 MMF Silver Mica
C56	.005 MFD Dual Disc Ceramic (Part of C47)
C57	.005 MFD Dual Disc Ceramic (Part of C65)
C58	2 MMF Silver Mica
C59	.002 MFD Disc Ceramic
C61	.005 MFD Dual Disc Ceramic (Part of C66)
C65	.005 MFD Dual Disc Ceramic (Part of C57)
C66	.005 MFD Dual Disc Ceramic (Part of C61)
C67	.005 MF Disc Ceramic
C71	250 MMF Tubular Ceramic
C72	.01 MFD Disc Ceramic
C74	.01 MFD Disc Ceramic
C75	100 MMF Silver Mica
C76	.01 MFD Disc Ceramic
C80	24 MMF BFO Pitch Control Part #325-2
C81	.01 MFD Disc Ceramic
C82	GIMMICK
C83	.01 MFD Disc Ceramic
C85	75 MMF Silver Mica
C91	20 MFD 350 Volt Electrolytic (Part of C101 & C111)
C92	.01 MFD Disc Ceramic
C94	.03 MFD 400 Volt Paper Tubular
C98	.01 MFD Disc Ceramic
C99	.01 MFD Disc Ceramic
C101	20 MFD 25 Volt Electrolytic (Part of C91 & C111)
C102	.01 MFD Disc Ceramic
C103	.005 MFD Disc Ceramic
C111	10 MFD 350 Volt Electrolytic (Part of C91 & C101)

R9	150K Ohm	½W.	Resistor
R10	10K Ohm Potentiometer (Part of R92)		
R11	100 Ohm	½W.	Resistor
R12	68 Ohm	½W.	Resistor
R13	470 Ohm	½W.	Resistor
R14	470 Ohm	½W.	Resistor
R15	100K Ohm	½W.	Resistor

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PMR-7 PARTS LIST

R16	15K Ohm	1 W.	Resistor
R17	4.7K Ohm	1 W.	Resistor
R21	180 Ohm	½W.	Resistor
R25	100K Ohm	½W.	Resistor
R26	220K Ohm	½W.	Resistor
R27	100K Ohm	1 W.	Resistor
R35	47K Ohm	1 W.	Resistor
R41	1000 Ohm	½W.	Resistor
R46	150K Ohm	½W.	Resistor
R47	1000 Ohm	½W.	Resistor
R55	6.8M Ohm	½W.	Resistor
R56	150K Ohm	½W.	Resistor
R57	47K Ohm	1 W.	Resistor
R58	100K Ohm	½W.	Resistor
R59	150K Ohm	½W.	Resistor
R61	1000 Ohm	½W.	Resistor
R65	100K Ohm	½W.	Resistor
R66	150K Ohm	½W.	Resistor
R67	1000 Ohm	½W.	Resistor
R71	220K Ohm	½W.	Resistor
R72	330K Ohm	½W.	Resistor
R73	560K Ohm	½W.	Resistor
R74	1M Ohm	½W.	Resistor
R75	1M Ohm	½W.	Resistor
R76	1.2M Ohm	½W.	Resistor
R77	2.7K Ohm	½W.	Resistor
R78	100K Ohm	½W.	Resistor
R81	10K Ohm	Potentiometer	(Part of R90)
R82	100K Ohm	½W.	Resistor
R83	100K Ohm	½W.	Resistor
R84	220K Ohm	½W.	Resistor
R85	100K Ohm	½W.	Resistor
R90	100K Ohm	Potentiometer	(Part of R81)
R91	100K Ohm	½W.	Resistor
R92	500K Ohm	Potentiometer	(Part of R10)
R93	6.8M Ohm	½W.	Resistor
R94	2.2M Ohm	½W.	Resistor
R95	470K Ohm	½W.	Resistor
R96	150K Ohm	½W.	Resistor
R97	2.2M Ohm	½W.	Resistor
R98	1M Ohm	½W.	Resistor
R99	1M Ohm	½W.	Resistor
R101	390 Ohm	1 W.	Resistor
R102	470K Ohm	½W.	Resistor
R103	6.8 Ohm	1 W.	Resistor

SW1 A to G	Bandswitch Part #313
SW2	ON-OFF Switch on R92
SW71	S.P.S.T. Slide Switch (ANL)
SW72	S.P.S.T. Switch on R90 (AVC)
SW81	S.P.S.T. Slide Switch (BFO)

TA-1	40 and 10 Meter Antenna Coil	Part #349
TA-2	80 and 15 Meter Antenna Coil	Part #346
TA-3	160 and 20 Meter Antenna Coil	Part #343
TA-4	Broadcast Antenna Coil	Part #341
TC-1	40 and 10 Meter Converter Coil	Part #350
TC-2	80 and 15 Meter Converter Coil	Part #347
TC-3	160 and 20 Meter Converter Coil	Part #344
TC-4	Broadcast Converter Coil	Part #342
TO-1	40 and 10 Meter Oscillator Coil	Part #351
TO-2	80 and 15 Meter Oscillator Coil	Part #348
TO-3	160 and 20 Meter Oscillator Coil	Part #345
TO-4	Broadcast Oscillator Coil	Part #340
T-2	2238 Kc. I.F. Transformer	Part #339
T-4	2238 Kc. I.F. Transformer	Part #339

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This is just a friendly note to make you aware of a project that members of Chapter 145 in Asheville, North Carolina have been working on for quite a while – an ANTIQUE RADIO MUSEUM. We call it - The Southern Appalachian Radio Museum and it is located on the campus of Asheville-Buncombe Technical Community College, near downtown Asheville. We are incorporated in the state of North Carolina as a non-profit organization and have IRS authorization under the provisions of paragraph 501/C (3) to provide for tax-deductible donations to the Museum, either in equipment or financial contributions.

The Museum is relatively new, having only been in existence for about a year and a half. We have made substantial progress in acquiring equipment for our displays which now include items such as a 1918 Spark Gap Receiver, several Atwater-Kent radios, various other AM/SW radios from the 1930's through the 1960's. We have also collected a lot of ham equipment by Ameco, B & W, Clegg, Drake, Galaxy, Gonset, Hallicrafters, Hammarlund, Harvey Wells, Heathkit, Morrow, Multi-Elmac, National, RME, Swan, Ten-Tec and others. We recently obtained a "mobile" transmitter by RCA used by law enforcement from 1936 in excellent condition….it weighs 65 pounds.

We have a club station on the air from the Museum using the callsign W4AFM. Some of you may recognize this call as belonging to the late Bill Hayes, who passed away last year. His family graciously allowed us to apply for his callsign. We are very pleased to be able to honor him for his many years of service to the amateur radio community, and his close association with our project.

We have obtained financial support for the Museum project from the ARRL Foundation in the form of a matching funds grant in the amount of $10,000. However, since it is a matching funds arrangement, we need the help of anyone interested in preserving the history of radio/electronics. The initial grant gave us only $1,000 cash and we need to raise $9,000 to obtain the balance of the grant. Through the generosity of many friends, we have raised a large part of that amount but we still need more by December (deadline for applying for the remaining $9,000).

Unfortunately, donated equipment cannot be considered for the purposes of this grant – we need either cash donations, or pledges of financial support. We still solicit equipment for the Museum, we just cannot use it for the grant. And, please remember that ANY donation to the Museum project, equipment or financial, is tax-deductible.

Would you consider being a supporter of this very worthwhile project? We don't ask for any specific amount, every dollar counts at this point. I am including a stamped, self-addressed envelope for your convenience in responding. Even if you are unable to help us financially at this time, we would appreciate hearing from you. We welcome you to visit us at the Museum and I am also enclosing one of our brochures which includes more information, including a map, and how to contact us. At present, we have the Museum open for visitors on Wednesdays from 1 to 4 PM. If that is not convenient for you, you may contact one of those listed on the brochure to arrange a day/time to suit your schedule.

Thank you for your time in reading this and we look forward to hearing from you.

Very 73,

Carl E. Smith, N4AA
President, QCWA Chapter # 145
President, The Southern Appalachian Radio Museum, Inc.

Web Site: www.Saradiomuseum.org

PMR-7 PARTS LIST

T-5	262 Kc. Input I.F. Transformer #338
T-6	262 Kc. Output I.F. Transformer #337
T-8	262 Kc. Beat Frequency Oscillator Coil Part #336
T-10	Output Transformer Part #357
CR50	2500 Kc. Crystal
V1	6BZ6 R.F. Amplifier
V2	6BE6 First Mixer
V3	6C4 H.F. Oscillator
V4	6BJ6 2238 Kc. I.F. Amplifier
V5	6X8 Second Mixer and Oscillator
V6	6BA6 262 Kc. I.F. Amplifier
V7	6BJ7 Second Detector, ANL, and DAVC
V8	12AU7 Beat Frequency Oscillator and Isolation Amplifier
V9	6AN8 First Audio Amplifier and Squelch
V10	6AQ5 Audio Output Amplifier

4.3 PSR-117 PARTS LIST

C-201	20 MFD 350 Volt Electrolytic (Part of C-202)		
C-202	20 MFD 350 Volt Electrolytic (Part of C-201)		
R-200	500 Ohm Potentiometer (S Meter Adjustment)		
R-201	47K Ohm	2W.	Resistor
R-202	390 Ohm	1W.	Resistor
R-203	10K Ohm	10W.	Resistor
V-201	6BW4 Rectifier		
V-202	OB2 Voltage Regulator		
CH-201	8 Henry Filter Choke Part #121C2		
F-201	1½ A. Slow Blow Fuse		
T-201	Power Transformer Part #121P71		

4.4 PSR-612 PARTS LIST

C-301	20 MFD 350 Volt Electrolytic (Part of C-302)		
C-302	20 MFD 350 Volt Electrolytic (Part of C-301)		
C-303	250 MMF Tubular Ceramic		
C-304	.005 MFD 1600 Volt Disc Ceramic		
C-305	.5 MFD 120 Volt Hash Capacitor		
C-306	.5 MFD 120 Volt Hash Capacitor		
C-307	.5 MFD 120 Volt Hash Capacitor		
C-308	250 MMF Tubular Ceramic		
C-309	250 MMF Tubular Ceramic		
R-301	4.7K Ohm	1W.	Resistor
R-302	600 Ohm	10W.	Resistor
R-303	10K Ohm	10W.	Resistor
R-304	270 Ohm	1W.	Resistor
R-305	270 Ohm	1W.	Resistor
R-306	25 Ohm	10W.	Resistor
F-301	14 A. Fuse		
L-301	Hash Choke Mallory #583		
L-302	Hash Choke Mallory #582		
T-301	Power Transformer Part #121P45		
V-301	6X4 Rectifier		
V-302	6X4 Rectifier		
V-303	OB2 Voltage Regulator		
VB-301	Vibrator Part #1514		

4.5 ESS-3 PARTS LIST

S Meter	0 - 1 MA. D.C. 2″ Square Meter		
R-200	500 Ohm Potentiometer		
R-201	47K Ohm	2W.	Resistor
R-202	390 Ohm	1W.	Resistor

W4AFM

Southern Appalachian Radio Museum, Inc.

PO Box 249
Leicester, North Carolina 28748
828-683-4251

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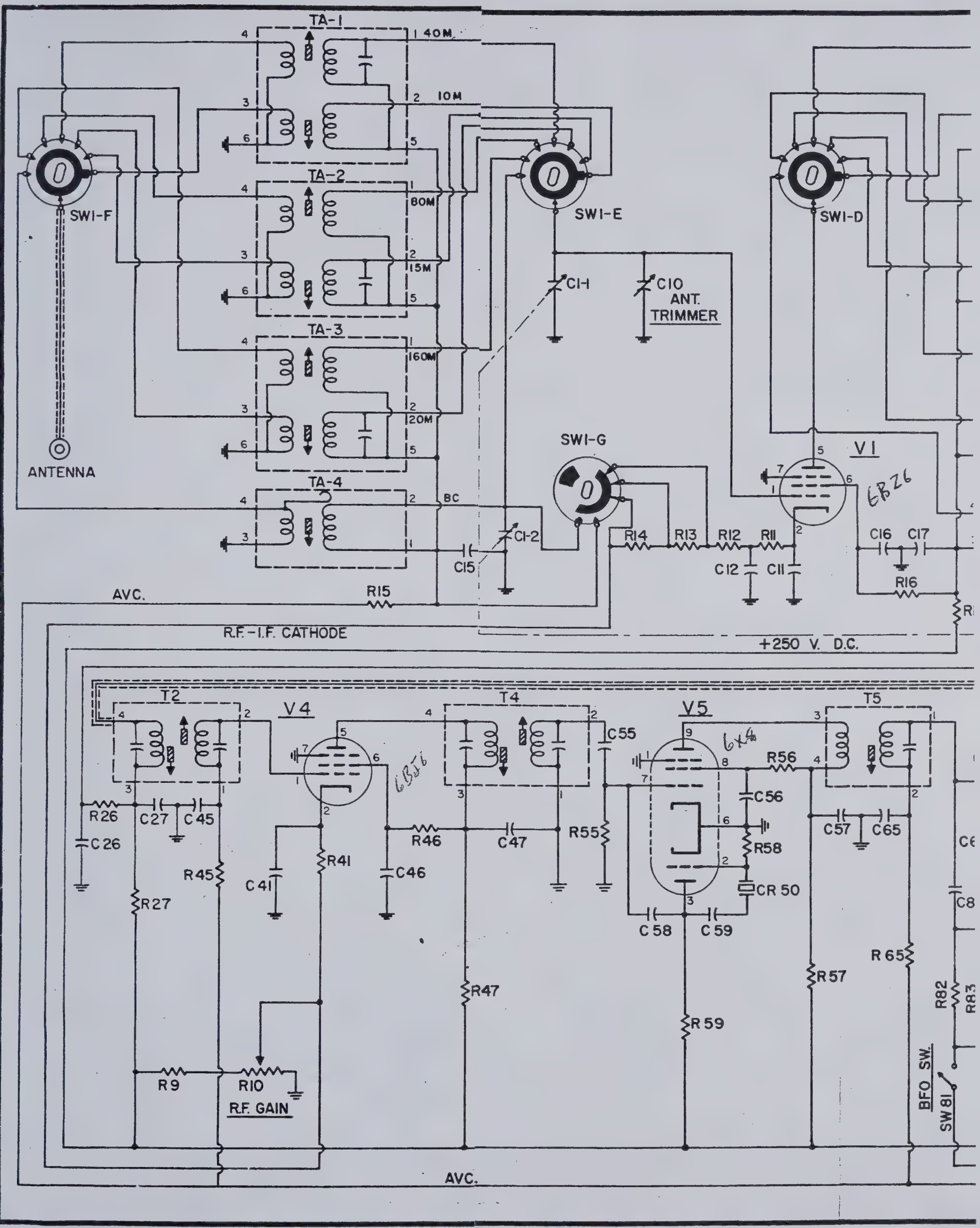
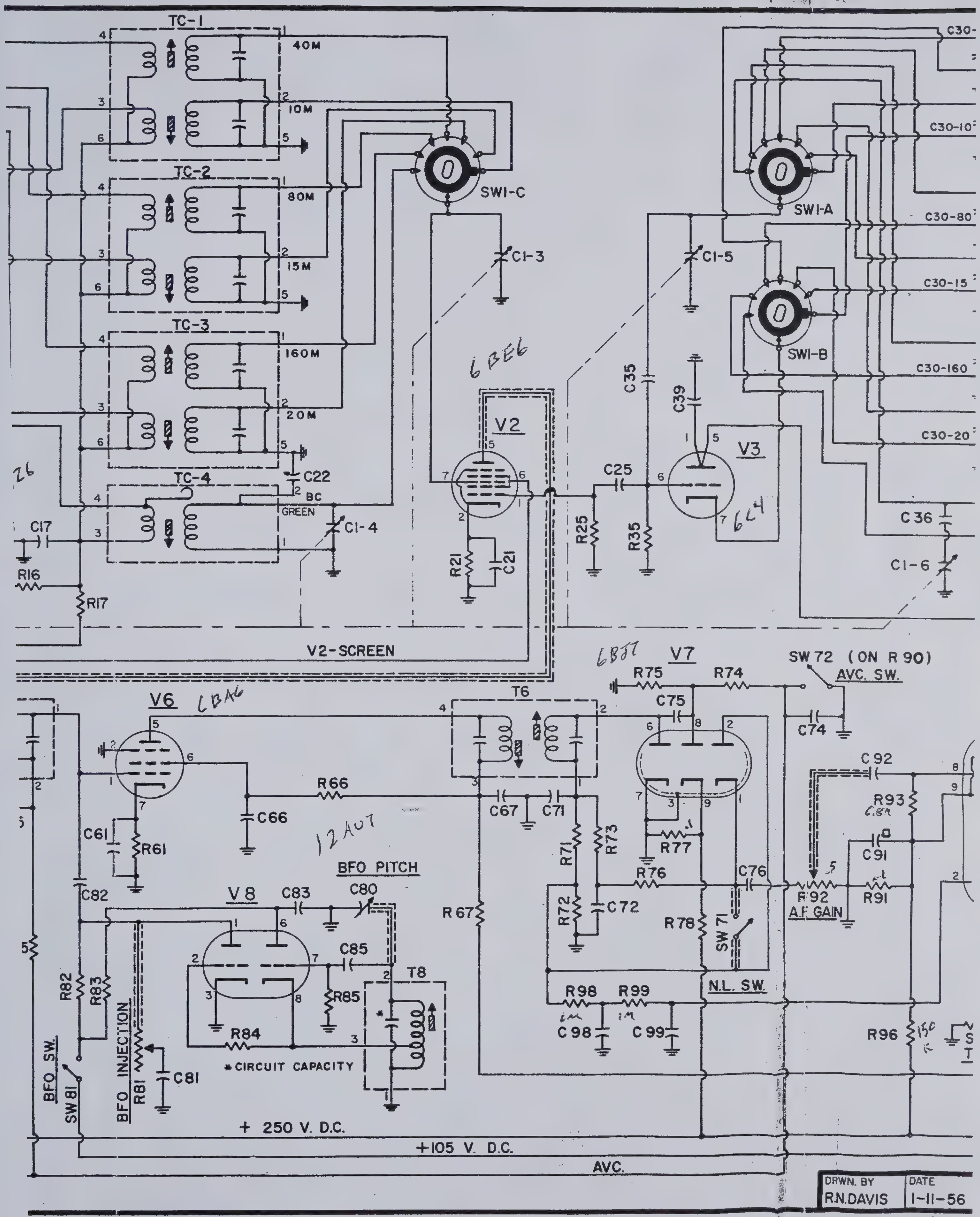

TA-1
1 40M.
2 10M
TA-2
80M
15M
TA-3
160M
20M
TA-4
BC
SWI-F
SWI-E
SWI-D
SWI-G
ANTENNA
CI-I
C10 ANT. TRIMMER
CI-2
C15
V1
6BZ6
R14
R13
R12
R11
C12
C11
C16
C17
R16
AVC.
R15
R.F.-I.F. CATHODE
+250 V. D.C.
T2
V4
6BJ6
T4
V5
6X4
T5
C55
R56
C56
R58
CR 50
C57
C65
R26
C27
C45
C26
R45
R27
C41
R41
C46
R46
C47
R55
C58
C59
R47
R57
R59
R65
R82
R83
C8
C6
R9
R10
R.F. GAIN
BFO SW.
SW 81
AVC.

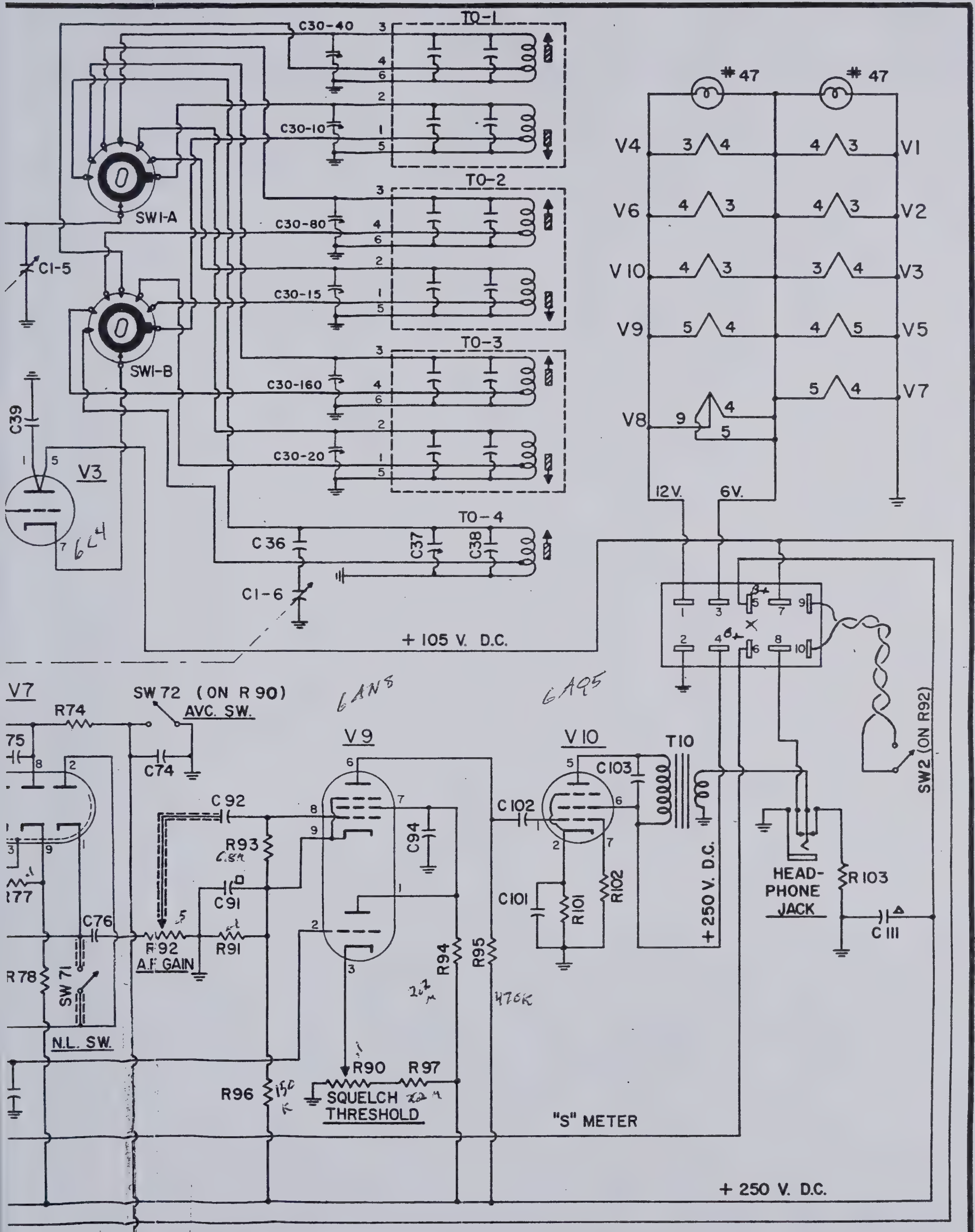
1/3



DRWN. BY	DATE
R.N.DAVIS	1-11-56

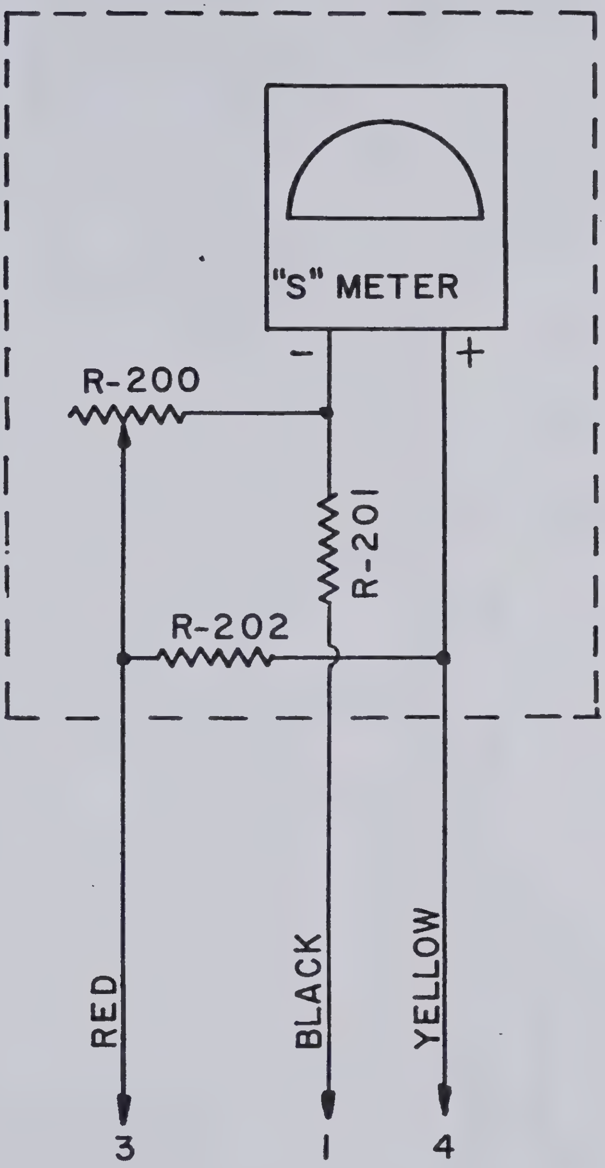
2/3

1'



DRWN. BY R.N.DAVIS	DATE 1-11-56	PMR-7	MULTI-PRODUCTS CO.	378

3/3

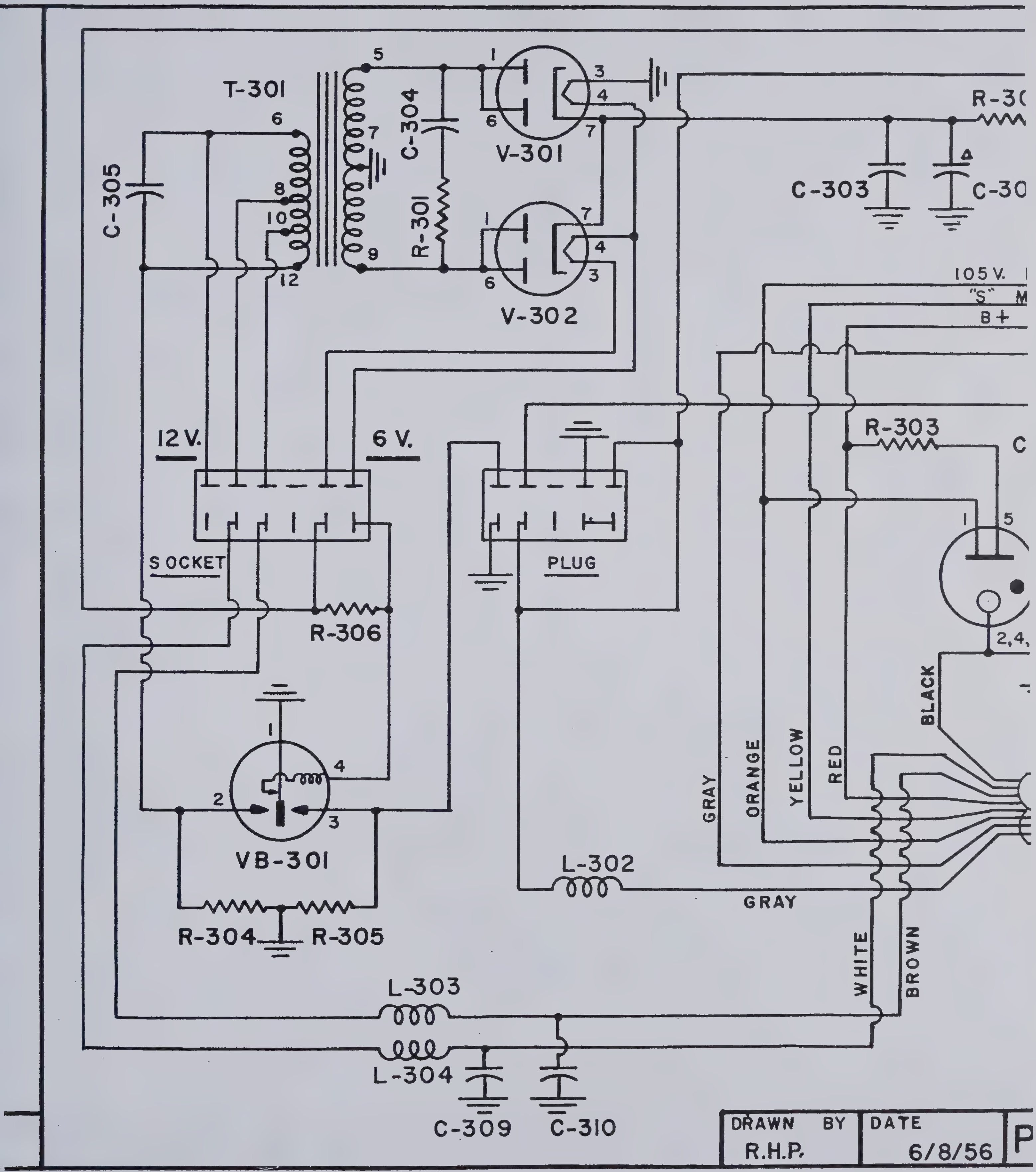


REMOVE JUMPER FROM PINS 3 AND 4 ON UTILITY & CONTROL PLUG AND CONNECT ABOVE NUMBERED WIRES TO CORRESPONDING UTILITY PLUG PIN NUMBERS.

ESS-3 ACCESSORY

C-305

1/3



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R.H.P.	6/8/56	

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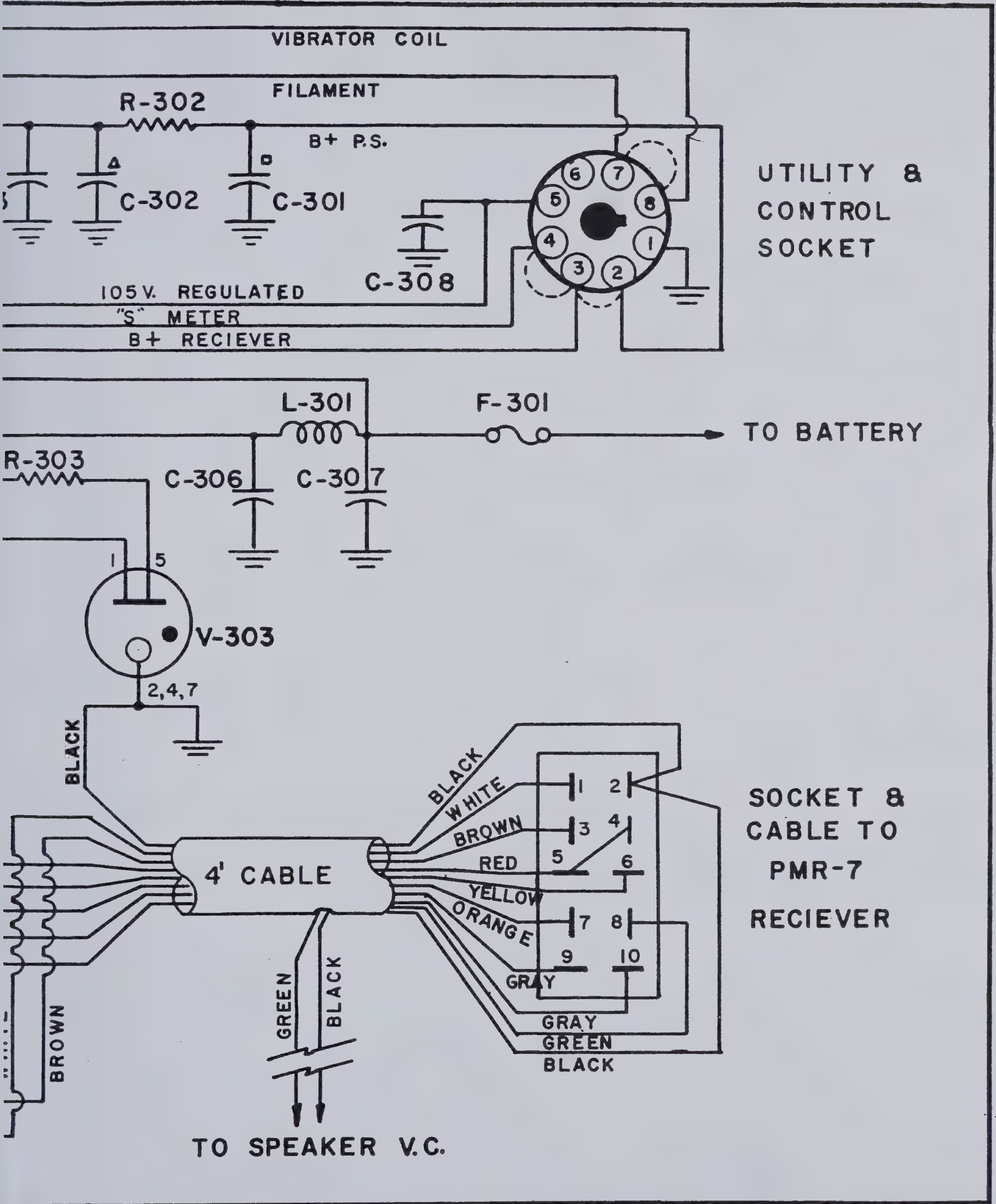
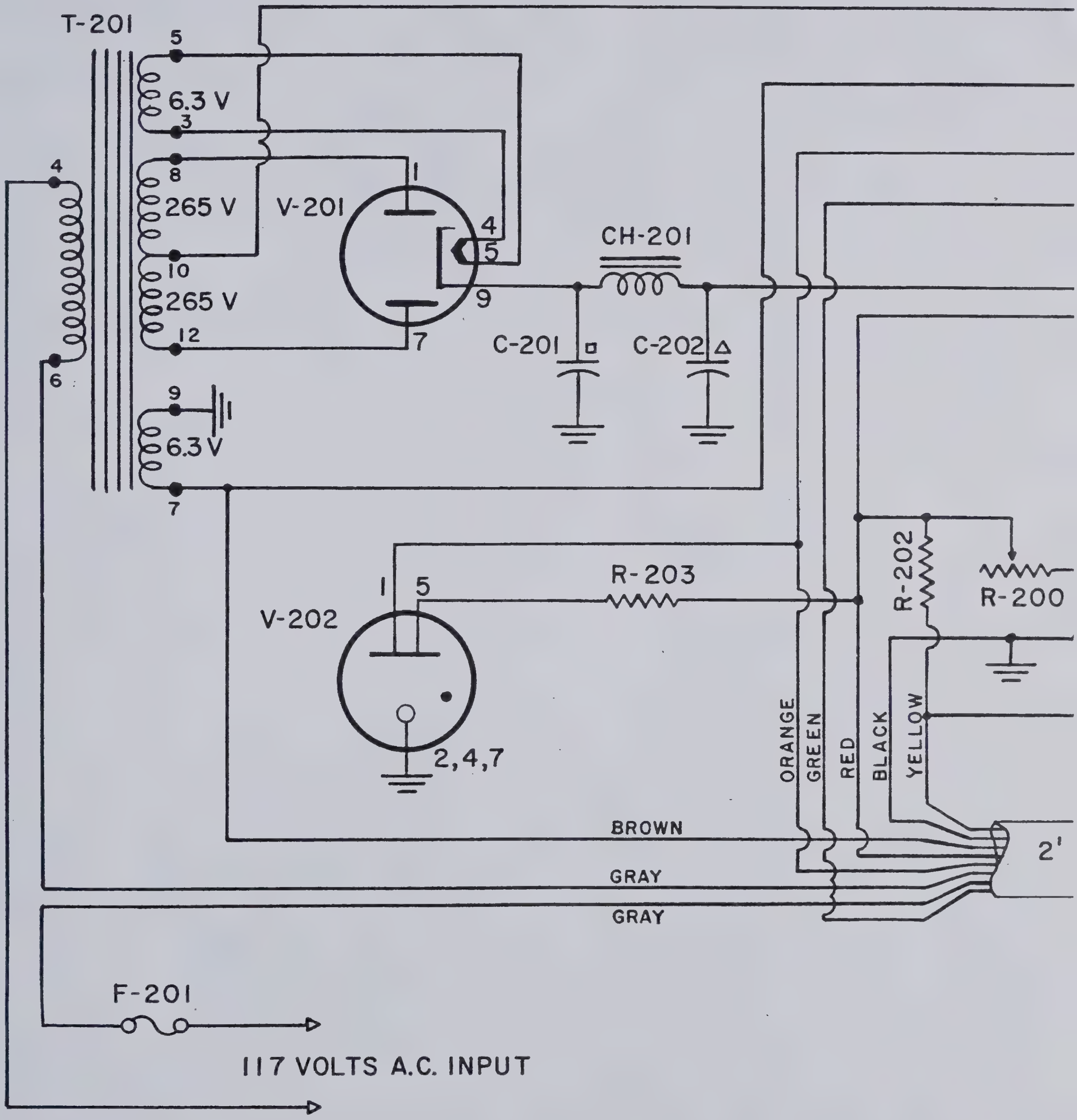
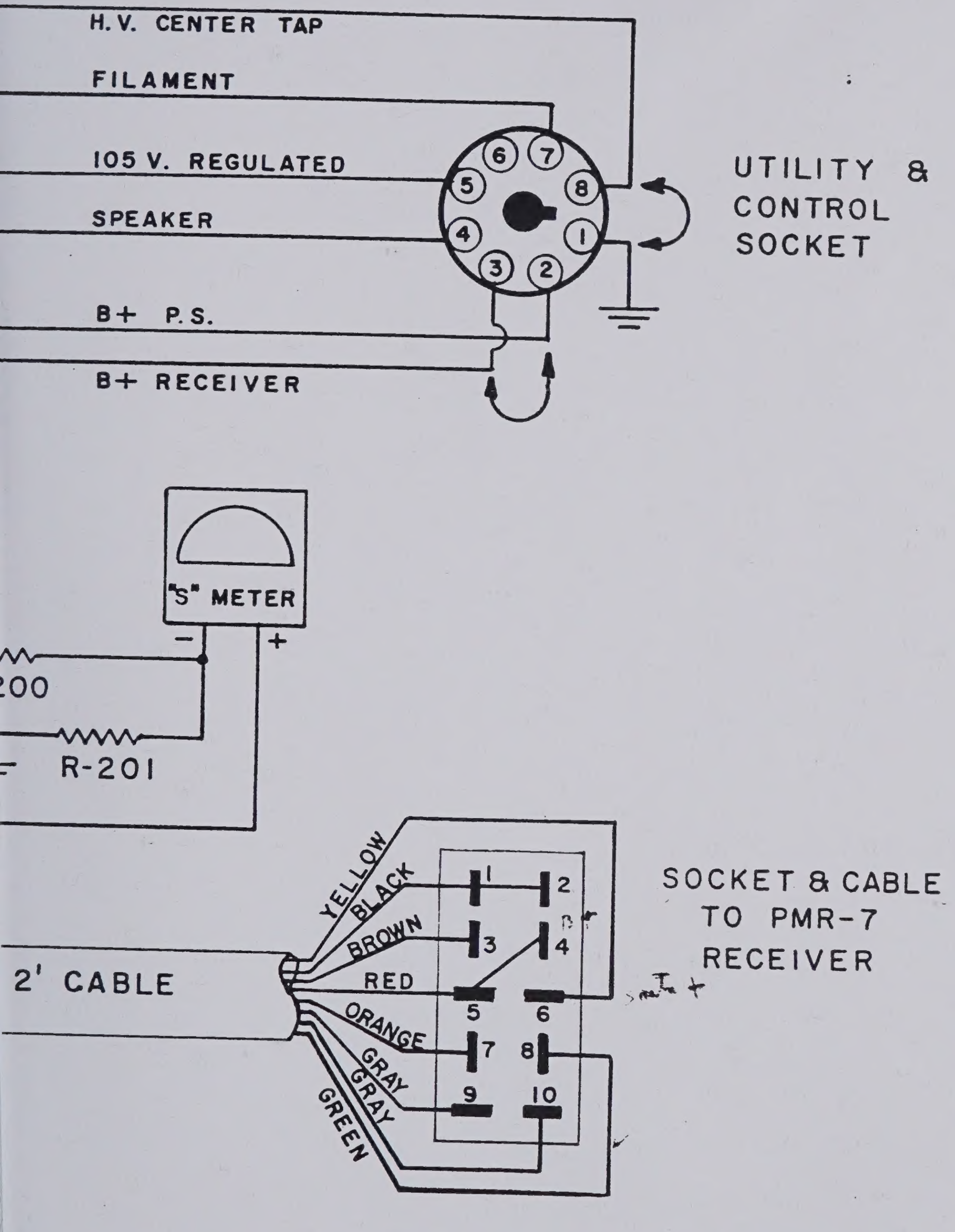


DATE 6/8/56	PSR-612	Multi-Products Co.	388



DRWN.	DATE	PS
G.E.UNDY	2/13/56	

1/2



SR-117	Multi-Products Co.	363

2/2